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10 July 1984

West Europe Report

SCIENCE AND TECHNOLOGY

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JPRS-WST-84-024

10 July 1984

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

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ADVANCED MATERIALS

FINLAND, SWEDEN COOPERATE IN COMPOSITES RESEARCH

Helsingborg PLASTFORUM SCANDINAVIA in Swedish No 5, 1984 p 46

[Text] The Technological Development Center in Finland has granted 1.4 million marks to the Institute of Textile Technology at Tammerfors Technical Institute (Professor Pertti Tormala) and the Institute for Technical Polymer Chemistry at Abo Academy (Professor Bengt Stenlund) for a 3-year research project with the following goals:

(1) To investigate the structure and properties of different glass fibers.

(2) To investigate the usefulness of different glass fibers and glass fiber filler mixtures as reinforcing material in thermoplastics, as sandwiching material in various laminated constructions, as reinforcement in thermoset plastics and as a supplement in the structure of porous fiberglass bonding agents (fiberglass wool).

(3) To develop still further adhesion promotors and bonding materials, primarily for thermoplastics but also for thermoset plastic composites.

(4) To develop a method for measuring adhesion between thermoplastic polymers, fiberglass and filling agents, plus a method for determining critical length of fiber for reinforcing material.

(5) To investigate and develop new production methods and semi-finished product methods for the manufacture of thermoplastic composite material containing fibers and filling agents, especially considering that the length of the fiber is preserved during formation and that the adhesion between the reinforcing and filling material and the polymer matrix is optimal with regard to the mechanical properties of the final product.

With the help of the above investigations it is intended to:

a) Collect technical/scientific background information which will promote the Finnish plastic, glass and mineral fiber industry, and the mineral industry.

b) Reach a level of knowledge which will make it possible to develop new uses for domestic glass and mineral fibers and mineral-based extenders.

c) Develop new measuring methods which will quickly give correct information about the possibilities of mixing finished reinforcing and filling material.

d) Attain a level of knowledge which in a later phase will make possible product development work with the intention of:

- manufacturing plastic composites which are considerably stronger than the present composites,

- replacing imported reinforcing and filling material,

- exporting reinforcing and filling material and manufacturing technology for composite materials,

- creating new production technology for the country's plastic industry.

Project research will be carried out by the Polymer and Fiber Technology Laboratory of Tammerfors Technical Institute under the leadership of Professor Pertti Tormala, and at Abo Academy's Institute of Technical Polymer Chemistry under the leadership of Professor Bengt Stenlund.

According to the project plan the following plastics are to be included in the investigation:

- polyethylene

- polypropylene

- polyvinylchloride

- polyamide

- polyurethane

- polyester

- epoxy

- phenolic resin

The following reinforcing and filling agents are planned to be part of the project:

- fiberglass

- mineral fiber

- mixtures of mineral fibers and powdered minerals

- calcium carbonate

- talc

- silica

- wollastonite

- mixtures of the above-named minerals

- whiskers fibers

- sawdust

Besides the cooperation which is already established between Tammerfors Technical Institute and Abo Academy, the project group is also striving to widen the cooperation. Assuming that project funds are appropriated in Sweden, the Institute for Polymer Technology at the Royal Technical Institute intends to investigate the effect of fibers and filling agents on the morphology of polymers, especially in the boundary layer. The Surface Chemical Institute in Stockholm is seeking project funds in order to start activity in the mineral sector to investigate the actual surface chemistry of the filling agents, and the reactions between the adhesives and the surface of the filling agents.

The Finnish part of the project will begin during the 1984 spring term.

9287
3698/491

AEROSPACE

STRUCTURE OF SYLDA DOUBLE LAUNCH SYSTEM FOR ARIANE

Paris L'AERONAUTIQUE ET L'ASTRONAUTIQUE in French No 105, 1984-2 pp 18-23

[Article by F. Chanut and M. Richard of the National Industrial Aerospace Company, Les Mureaux: "Structure of the SYLDA Double-Launch System for Ariane"]

[Text] The Ariane launcher can place into orbit simultaneously two independent satellites whose masses and volumes are equivalent to those of the satellites launched by Thor Delta or by the Space Shuttle using PAM-D [payload assist module D]. The device used for that purpose is a special adapter called SYLDA (Ariane double-launch system). The SYLDA architecture was designed to take into account the requirements and constraints imposed, on the one hand, by the satellites and, on the other hand, by the pre-launching stages and the separation sequence when the satellites are placed into orbit. The selection of materials and the dimensions of the structure reflect mainly mass, rigidity and strength requirements. The manufacturing and control processes were chosen as a function of the characteristics peculiar to the SYLDA structure and the high level of quality required. The static and dynamic performances of the structure were checked through tests, the results of which confirmed the designed values.

Introduction

The studies that were to show the economic advantages and the technical feasibility of double launches using the Ariane launcher were started in 1977.

Three double-launch principles were then considered:

- carrier satellite,
- carrier nose cone,
- carrier structure.

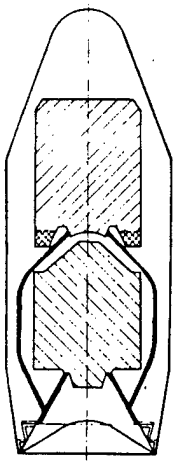

Figure 1. SYLDA and the Two Satellites Under the Nose Cone

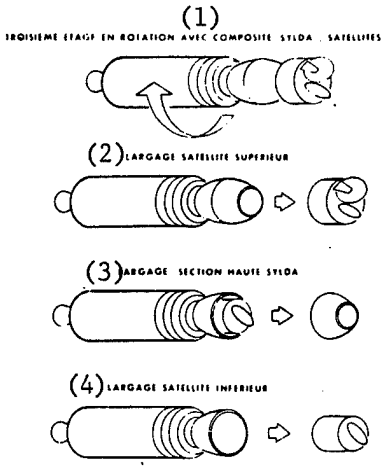

Figure 2. Principle of the Separation of the Two Satellites and the SYLDA Upper Section

Key:

1. Rotating third stage with SYLDA-satellite assembly
2. Launching of the upper satellite
3. Launching of the SYLDA upper section
4. Launching of the lower satellite

The first principle, which assumes that one satellite would carry the other, was soon abandoned because of the constraints it would place on payloads. The second principle was also abandoned because it would have required the development of a new nose cone for the launcher.

Therefore, the principle used was the third one, which provides for two independent satellites and makes it possible to use the standard nose cone of the Ariane launcher (Figure 1).

Architecture of the Structure

Architecture Selection

Several designs were possible for the carrier structure, depending:

- on the separation principle of the structure, which must allow for the installation and ejection of the lower satellite;

- on the construction type of the structure;

- on the form of the structure.

A selection study was made based on criteria of performance (mass, rigidity, strength, stability, flexibility with respect to possible changes, etc.), ease of implementation, development risk, time limits, material and component suppliers and cost.

This study led to the selection of axial separation for the SYLDA upper part, a hull-type structure made of a composite sandwich, and an ovoid shape for the structure section surrounding the lower satellite and supporting the upper satellite, the lower satellite being supported by a truncated cone. The separation principle selected is represented Figure 2.

The presence of a cylindrical section at the level of separation of the SYLDA upper and lower sections makes it easy to alter the structure height and therefore the volume available to the lower satellite. SYLDA exists in two versions, respectively 3,900 and 4,400 mm high (Figure 3). The 3,900-mm height is suitable for the Ariane I and II nose cones, and the 4,400-mm height for the Ariane III nose cone.

Description of the Structure

The structure assembly is shown on Plate 1.

The structure consists of an upper and a lower section. They are both designed according to the same principle: metallic frames provide the various junctions and separations at the ends of hulls made of a composite sandwich material.

The hull of the upper section and that of the outer lower section each consist of six identical sectors.

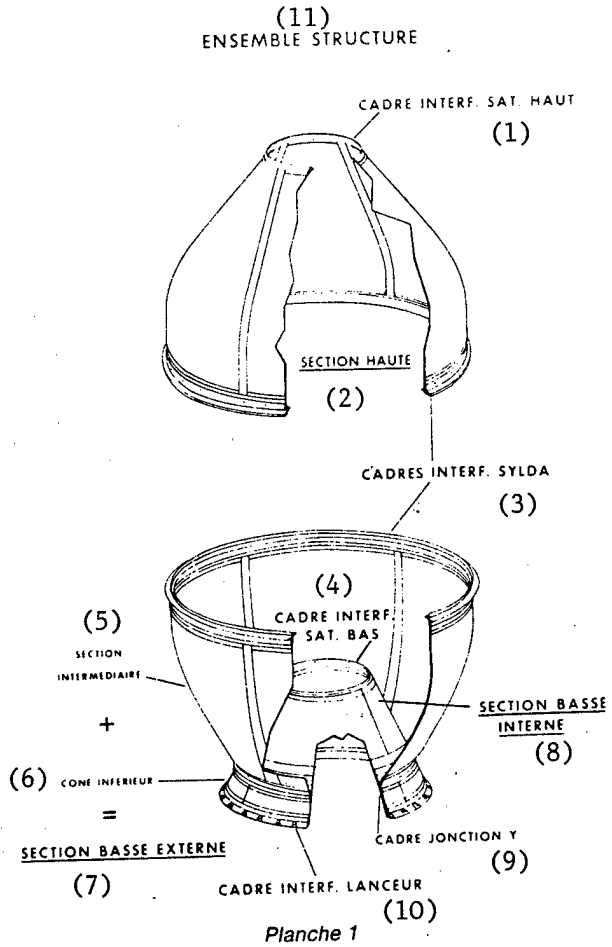

Planche 1

Plate 1

Key:

1. Upper satellite interface frame
2. Upper section
3. SYLDA interface frames
4. Lower satellite interface frame
5. Middle section
6. Lower cone
7. Outer lower section
8. Inner lower section
9. Y-shaped assembly frame
10. Launcher interface frame
11. Structure assembly

The conical section which receives the lower satellite can be disassembled from the outer lower section; such a disassembly capability is necessary to install the lower satellite.

SYLDA and the launcher are bolted together. The upper and lower sections are fastened together by a swing-clamp fastener.

The SYLDA/satellite interface frames is also provided with a swing-clamp fastener.

Dimensions of the Structure

Dimensioning Criteria

The SYLDA structure had to take into account the lateral and longitudinal frequency requirements of the SYLDA/satellite assembly, and strength requirements with respect to mechanical and thermal loads. The satellite characteristics imposed by the SYLDA dimensions are given below:

Table 1. Mass, Inertia and Dynamic Characteristics of the Upper and Lower Satellites (SYLDA 3900)

Characteristics	Range of Values
Mass	600 to 1,020 kg
Center of gravity height above the separation plane	700 to 850 mm
Main roll moment of inertia	150 to 300 m^2 kg
Main transversal moment of inertia	110 to 300 m^2 kg
Natural longitudinal frequency	38 to 45 Hz
Natural lateral frequency	15 Hz

Materials Selection

Using a metallic material to make the structure skins was not satisfactory because, in certain areas of the structure, dimensioning criteria would have required thicknesses below the technologically feasible minima. In addition, such a material would provide relatively little flexibility with respect to changes such as rigidity changes.

On the other hand, a composite-type material was well-suited to the structural requirements. Using skins made of preimpregnated fibers and varying the draping, the number of layers and the type of fiber, it was possible to adapt the structure to the requirements of each individual area.

Carbon fiber with a high modulus/specific weight ratio was found to be the most suitable.

The honeycomb structure sandwiched between the two skins (Figure 4) is made of a light-alloy foil that offers high mechanical characteristics for a small mass.

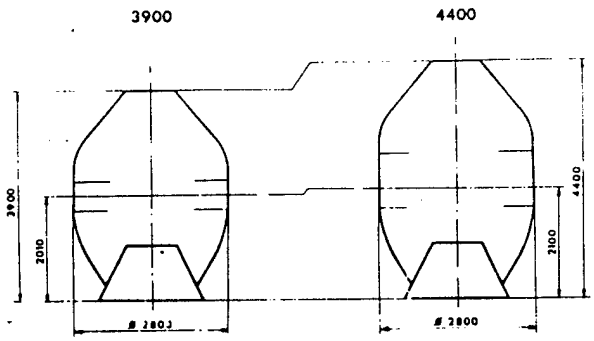

Figure 3. SYLDA Geometry

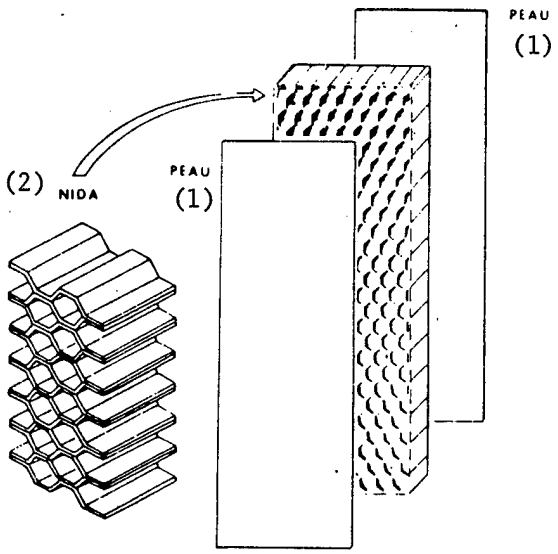

Figure 4. Sandwich (carbon skin, metal honeycomb)

Key:

1. Skin
2. Honeycomb

The frame material was chosen giving special consideration to part stability after machining, which was very important for large-diameter frames (diameter: 2,800 mm).

Checking the Dimensions

The SYLDA mathematical model required for mode analyses was prepared as follows:

- preparation of an overall model using the Bosor IV finite-difference program;

- reduction of the overall model to a four-point model;

- adjustment of the reduced model to reflect testing results.

The behavior of the structure under static and thermal loads was studied using the Bosor IV program. Detailed studies of the frames and frame/hull junctions were made using the Charetro finite-element program.

Special attention was given to the effect of thermal phenomena on junction behavior, taking into account differences in the expansion factors of the various materials used: carbon for the hull, light alloy for the frames, steel for the fastener strips.

The elementary tests required to justify the dimensions were performed. They involved the mechanical characteristics of the sandwich material at various temperatures, the effect of a misalignment of carbon fibers, the characteristics of junctions and reinforcements, and the thermal and thermo-optical characteristics of the sandwich material.

The structure thus obtained weighs about 140 kg in the case of the SYLDA 3900 and 150 kg in the case of the SYLDA 4400.

Fabrication of the Structure

Fabrication of a Sandwich Sector

The skins are made of preimpregnated carbon fibers arranged in 100-micron thick layers or plies; there are 4 to 8 such plies depending on the structure area and they are oriented at a well-defined angle (0.45 or 90°) with respect to the longitudinal axis.

Figure 5 shows the four layers making up the skin of an upper section sector.

The inner and outer skins of a sector are identical.

Draping is made on a forming mold provided with the necessary features to hold the fibers in place (Figure 6).

Polymerization is made in an autoclave in which pressure and temperature conditions are regulated. Each individual skin is controlled after polymerization.

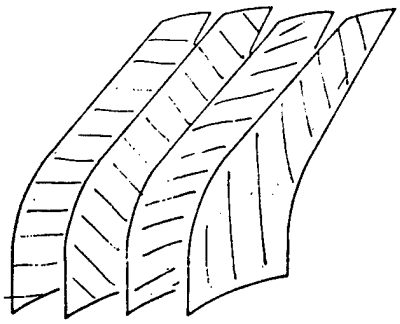

Figure 5. Four-Ply Skin

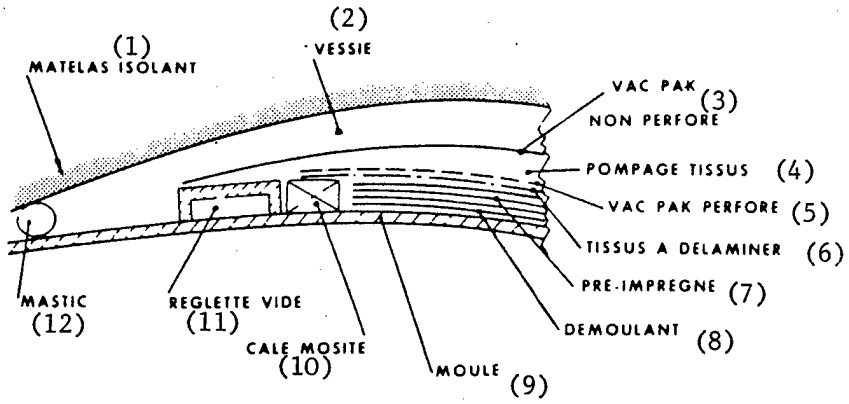

Figure 6. Draping of a Skin

Key:

1. Blanket
2. Bladder
3. Unperforated Vac Pak
4. Fabric pumping
5. Perforated Vac Pak
6. Fabric to be delaminated
7. Preimpregnated fibers
8. Unmolding agent
9. Mold
10. Mossite block
11. Hollow connection bar
12. Putty

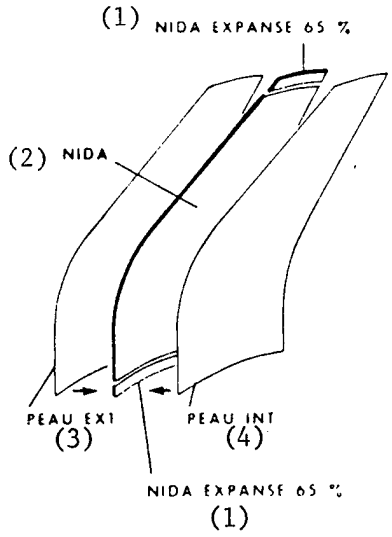

Figure 7. Sandwich Sector Assembly

Key:

1. 65-percent expanded honeycomb
2. Honeycomb
3. Outer skin
4. Inner skin

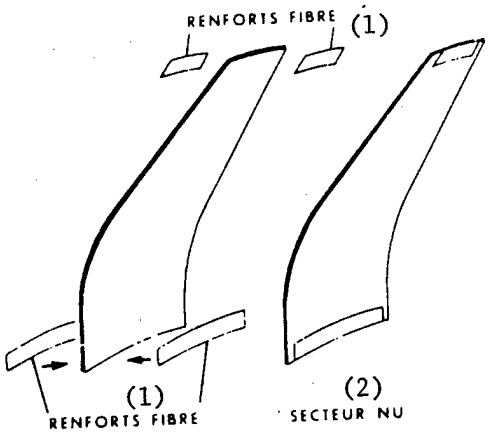

Figure 8. Reinforcement of a Sandwich Sector

Key:

1. Fiber reinforcements
2. Bare sector

A sandwich sector is obtained by hot-bonding a 10-mm thick honeycomb core between two carbon skins. At each end of the sector, there is under-expanded honeycomb (65 percent), which is necessary to make sure that the hull/frame junctions will hold (Figure 7). The sector edge is then simply finished with glue.

Carbon reinforcements are then hot-bonded to each end of the sector (Figure 8).

The bond quality on each sector is controlled by ultra-sounds.

Upper Section Assembly (See Plate 2)

The upper section, which consists essentially of two metallic frames and six sandwich sectors, is assembled using tools and a method that make any final machining unnecessary.

The frames and sectors are fastened together by bonding and bolting. Carbon fiber spacers are used to adapt the hull thickness to the metallic frame dimensions. The sectors are fastened to one another by bonding, and the junction is reinforced by longitudinal carbon splices. The upper frame closes up on the hull by means of rivetted circular metal splices.

Lower Section Fabrication

The lower section is more complex than the upper section (see Plate 1): the ovoid section is connected to the lower conical adapter through a Y-shaped frame and it must be possible to disassemble the adapter to strap in the lower satellite.

The hull of the adapter cone consists of an inner and an outer carbon skin provided with reinforcements (see Plate 3). Honeycomb blocks are glued to the inner skin; those located at the ends or in the area of the Y-shaped frame are under-expanded.

The honeycomb blocks are also glued to one another.

The outer skin, which consists of three identical sectors, is then glued on the honeycomb; the three sectors are fastened to one another by glued longitudinal carbon splices.

After the sandwich hull has been polymerized and checked, it is provided with its three metallic frames: lower satellite-interface frame, Y-shaped frame and launcher-interface frame. The frame and hull are fastened together by bonding and bolting. When the assembly is completed, the cone is cut off above the Y-shaped frame to allow for the assembly of the outer lower section (see Plate 4).

The outer lower section is assembled in the same manner as the upper section. No additional machining is required after assembly.

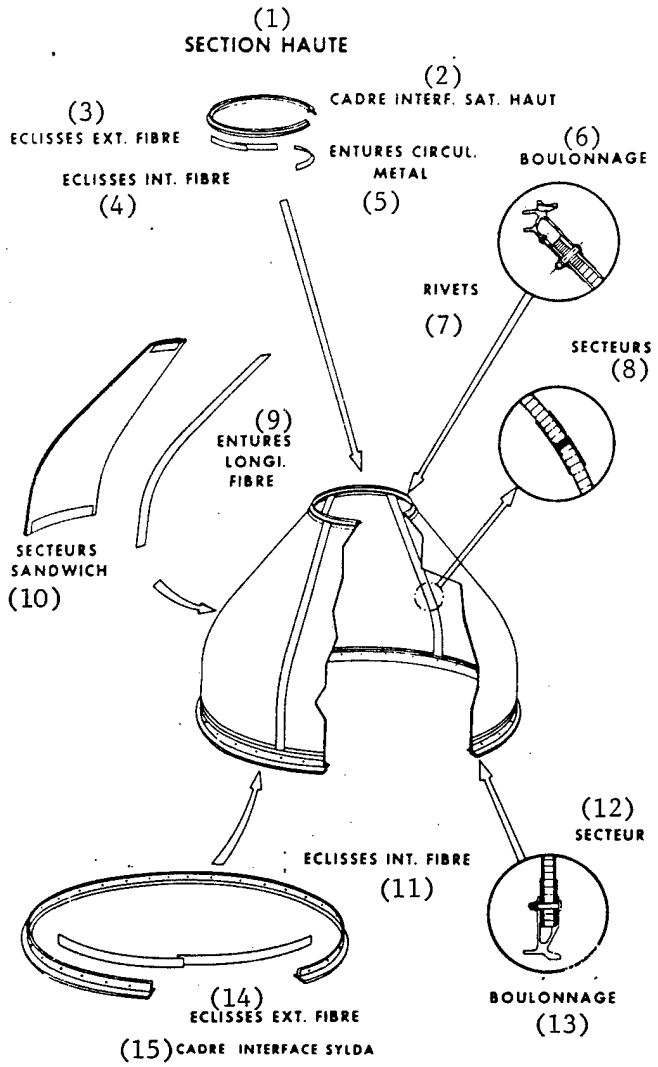

Plate 2

Key:

1. Upper section
2. Upper satellite interface frame
3. Outer fiber spacers
4. Inner fiber spacers
5. Metallic ring splices
6. Bolting
7. Rivets
8. Sectors
9. Longitudinal fiber splices
10. Sandwich sectors
11. Inner fiber spacers
12. Sector
13. Bolting
14. Outer fiber spacers
15. SYLDA interface frame

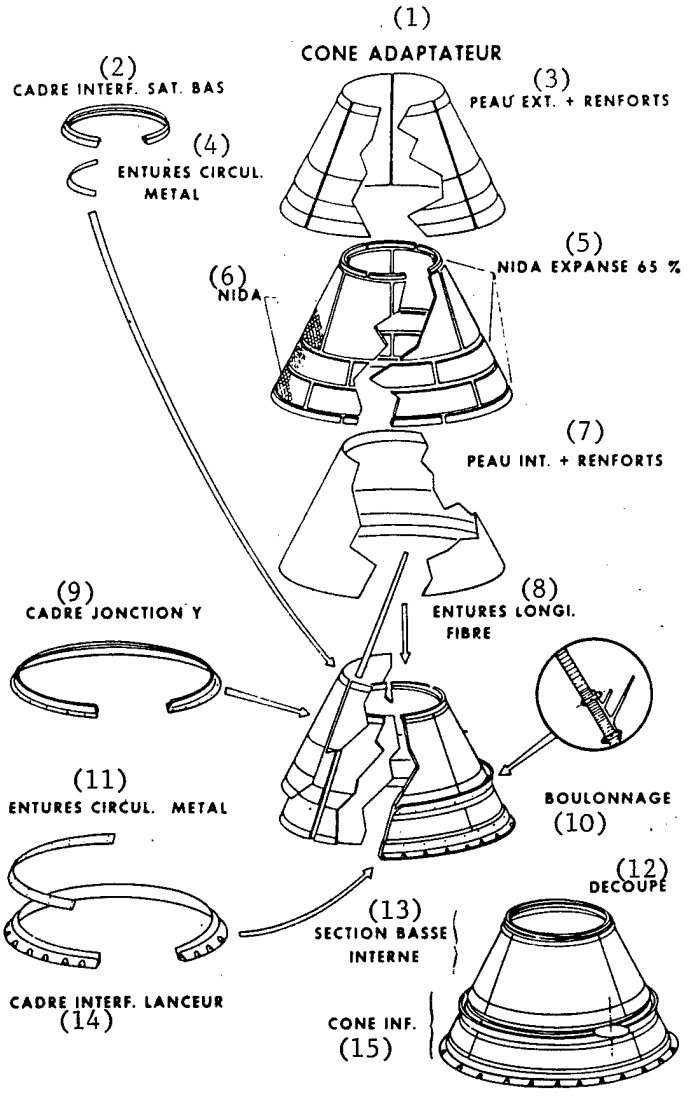

Plate 3

Key:

1. Adapter cone
2. Lower satellite interface frame
3. Outer skin + reinforcements
4. Metallic ring splices
5. 65-percent expanded honeycomb
6. Honeycomb
7. Inner skin + reinforcements
8. Longitudinal fiber splices
9. Y-shaped assembly frame
10. Bolting
11. Metallic ring splices
12. Top cut off
13. Lower inner section
14. Launcher interface frame
15. Lower cone

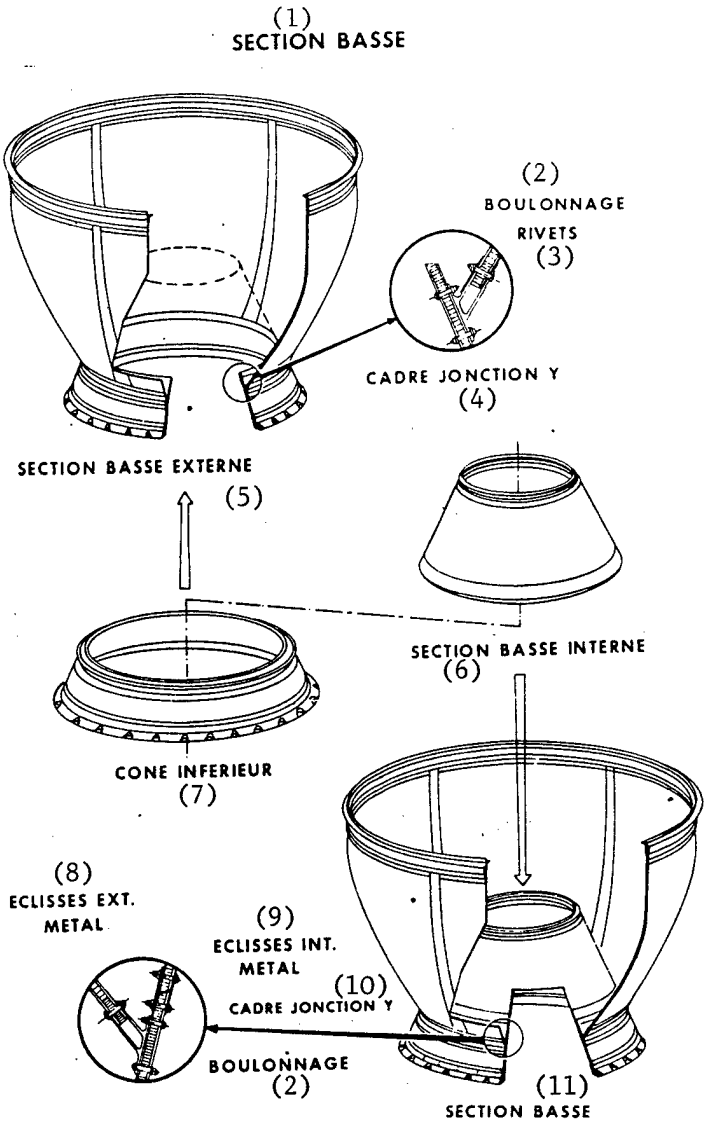

Plate 4

Key:

1. Lower section
2. Bolting
3. Rivets
4. Y-shaped assembly frame
5. Outer lower section
6. Inner lower section
7. Lower cone
8. Outer metallic spacers
9. Inner metallic spacers
10. Y-shaped assembly frame
11. Lower section

The inner lower section and the outer lower section are connected by a set of bolted metallic spacers, and can thus be disassembled.

Structure Adaptation to the Mission

To meet the requirements of the lower satellite, it is possible to cut out access openings in the hull of the upper section and in that of the outer lower section. These openings are obtained by merely cutting out part of the sandwich sectors.

The edges of the openings are finished with cold glue.

Testing

Preliminary Tests on the Adapter Cone

The first structural tests were made on a simple adapter cone, i.e. a cone without the Y-shaped frame. These static and dynamic tests made it possible to validate the mathematical models.

Tests on the Qualification Unit

The qualification unit was first subjected to mode testing to check the longitudinal, lateral and torsion modes. Static tests then made it possible to check the flexibility of the structure and its resistance to combined (axial and lateral) loads.

Acoustic tests showed that the structure assembly could withstand a severe environment (146 dB) without deteriorating. The qualification structure was then used at the Guyana Space Center to check and adjust integration procedures and, after a series of separation tests, it was again subjected to static tests. The results of these tests were quite similar to those of the first series of tests, which shows that the structure performance is not affected by an 18-month ageing without any special storage provisions.

Finally, the unit was subjected to a rupture test involving axial compression first of the ovoid section, then of the conical section. The rupture load of the ovoid section was 34 tons, that of the conical section, 72 tons. The flows corresponding to these loads are markedly higher than those yielded by flight loads. This is due to the fact that SYLDA is dimensioned so as to be rigid rather than to resist stresses.

Test on a Flight Model

A flight model was subjected to a flexibility test to make sure that the SYLDA structural characteristics were reproducible.

The results of this test were identical to those obtained with the qualification unit.

Flight Tests

Two SYLDA 3900 units were used when the Ariane L5 and L6 were launched.

Although the L5 payloads (Marecs and Sirio satellites) were not placed into orbit due to the failure of the third stage, no incident related to the SYLDA operation was found to have occurred.

The L6 payloads (the European telecommunication satellite ECS1 and the Amsat amateur-radio satellite) were successfully placed into orbit on 16 June 1983. Measurements made in flight made it possible to check the dynamic characteristics that had been calculated during development.

Conclusion

The safety margins calculated and confirmed by tests, and new specifications for the Ariane launcher flight loads make it possible for SYLDA 4400 to carry two satellites, the characteristics of which are given in Table 2.

Table 2. Mass and Intertia Characteristics of the Upper and Lower Satellites (SYLDA 4400)

Characteristics	Range of Values
Mass	900 to 1,400 kg
Center of gravity height above the separation place	1,200 to 1,300 mm
Main roll moment of inertia	300 to 400 m^2 kg
Main transversal moment of inertia	300 to 600 m^2 kg

The only structural change required to increase the carrying capacity of SYLDA (transition from the 3900 version to the 4400 version) is an elongation of the cylindrical section of the outer hull (Figure 3).

9294
CSO: 3698/481

FIAT OF ITALY DESIGNS EXPERIMENTAL CAR

Turin ATA INGEGNERIA AUTOMOTORISTICA in Italian Feb 84 pp 97-100

[Article by Pier Guido Castelli, FIAT Research Center, Orbassano-Turin]

[Text] 1. Introduction*

The research comprises the study and construction of a high-efficiency demonstration car in the medium to lower class, and its objective is:

--to document with figures the possibility of achieving appreciable reductions in fuel consumption through the development of advanced innovative technical solutions and their integration into a comprehensive automobile design;

--to furnish a "reference" to use as a basis for the development of low-consumption car designs to be produced after 1990.

The research is being conducted by the FIAT Research Center with the participation of FIAT Auto and, for the doors, by Alfa Romeo.

The study in question was arranged through a contract from the National Research Council within the framework of the Finalized Transportation Project.

2. Objectives

The car's primary objective is to achieve extremely low fuel consumption (40 km/l with 50 percent city driving at ECE 15 cycle and 50 percent at a constant speed of 90 km/h) with performance (acceleration and maximum speed) comparable to the average of present-day cars of the same class. Passenger space and comfort were improved and were comparable to those of cars which are in a class immediately above this one.

In addition, the car must be in keeping with European regulations anticipated for the 1990's with regard to emission, safety and noise. Figure 1 summarizes these objectives. The primary objective--fuel consumption--will be achieved through:

*Paper presented at the 19th ATA National Congress, Modena, 5-7 October 1983

--a drastic reduction in resistance to motion through greatly reduced weight (535 kg without load), aerodynamic thrust (Cx = 0.25) and low rolling coefficient (<80 N/t [newtons/rev]);

--a motor-drive assembly with a high rate of efficiency, using a direct-injection diesel motor and a gear train with wide-aperture continuous-ratio variation.

The above requires a series of innovations which are the subject of this research.

Figure 1. Specific Objectives

--Fuel consumption	40 km/1
--Performance	
--Maximum speed	135 km/h
--Time to go 400 meters from standing position	21 sec
--Time to go 1,000 meters from standing position	40.5 sec
--Passenger space	
--Number of passengers	5 persons
--Longitudinal space (with reference to comfort)	95 percent in front +95 percent in rear
--Comfort-handling	
--Improved comfort compared with present-day cars	
--Handling equivalent to present-day cars	
--Regulations applicable	
--European regulations to be in effect in the 1990's	

Figure 2. Research Program

--Preliminary project
- --Determination of specifications
- --Analysis and alternative options
- --Determination of basic configuration as starting point
- --Development and verification of feasibility of critical areas
- --Experimentation with mock-ups made to specification

--Engineering project
- --Drawing up construction designs
- --Determination of construction techniques
- --Verification of detail and assembly drawings

--Preparation and testing of prototypes
- --Construction and revision of first experimental prototype
- --Verification of project objectives
- --Preparation of definitive prototype

3. Research Program

The program shown in Figure 2 consists of three phases:

--the preliminary phase which covers the functional and interface specifications of the individual assemblies and subassemblies required for the new car, the derivation of various alternative solutions, and an analysis and list of options with regard to those alternatives to arrive at the car's basic configuration; a substantial part of this phase consists of intense experimentation through the construction of pilot assemblies to arrive at a more precise determination of the specifications and verify the feasibility of the alternative solutions;

--the phase involving the actual creation of the prototype by drawing up the individual assemblies, determining the construction techniques to be used and constructing and revamping, where necessary, the subassemblies in the shop;

--the phase involving the preparation and revamping of the prototypes, two being anticipated: the first for the experimental verification of the planned objectives and the second being the completed model with all parts finished and tested.

Figure 3. Work Schedule

--Systems analysis
--Framework
--External shape and passenger capacity
--Fixed and movable panels
--Mechanical properties
--Brakes
--Motor
--Gear train
--Experimentation with "mock-ups"

4. Work Program

The work, begun in 1982, was carried out according to the schedule shown in Figure 3. The action taken led to the determination of the car's reference configuration, identifying from among the various alternatives considered the basic solutions of the principal assemblies as hereinafter described.

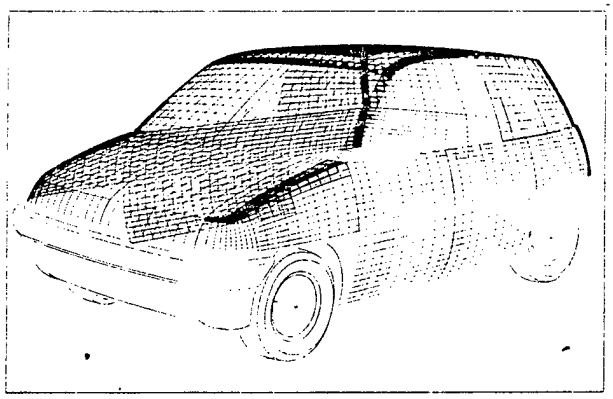

Figure 4. External Form

5. External Form

The car's external form is shown in Figure 4.

This form was selected from among several alternatives to assure a satisfactory compromise among aerodynamic resistance, passenger capacity and other factors.

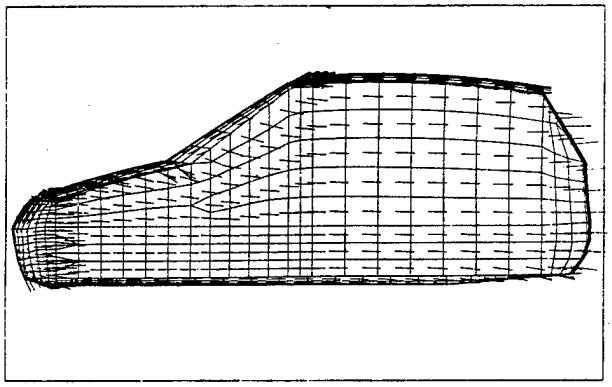

Figure 5. Calculation of Aerodynamic Flow

Figure 5 shows the normal course of the aerodynamic flow, while Figure 6 [omitted] shows the angles of the driver's seat and those of the rear passenger (by various percentages) congruent with the same form.

Verification trials in FIAT Auto's wind tunnel using a 1:5 scale model (shown in Figure 7) produced an aerodynamic coefficient of Cx = 0.195. In terms of passenger space, the longitudinal capacity is satisfactory, amounting to 95 percent in both front and back in comfortable position, as shown in Figure 8.

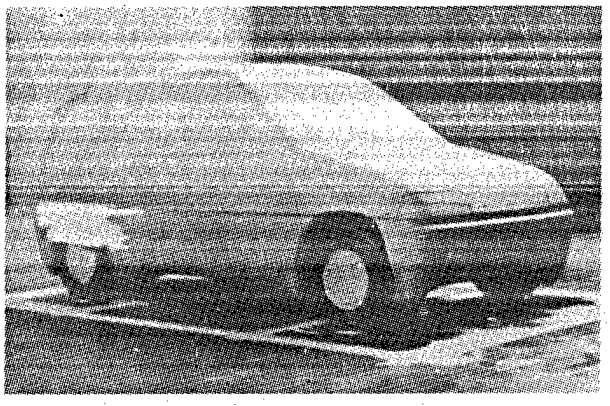

Figure 7. 1:5 Scale Model Cx=0.195

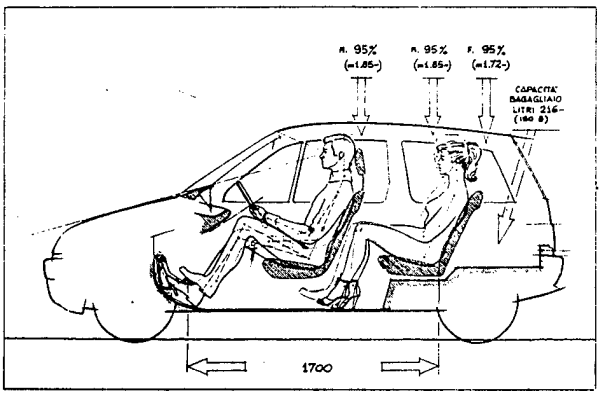

Figure 8. Showing Passenger Space

6. Body Shape

The choice of the vehicle's body shape was made in consideration of two contrasting requirements--lightness and structural adequacy--with particular attention to safety.

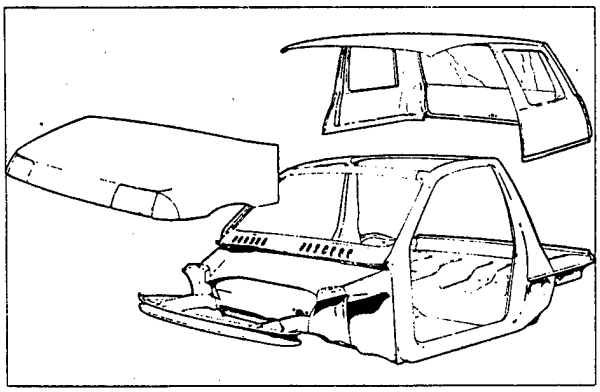

Figure 9. Structural Concept

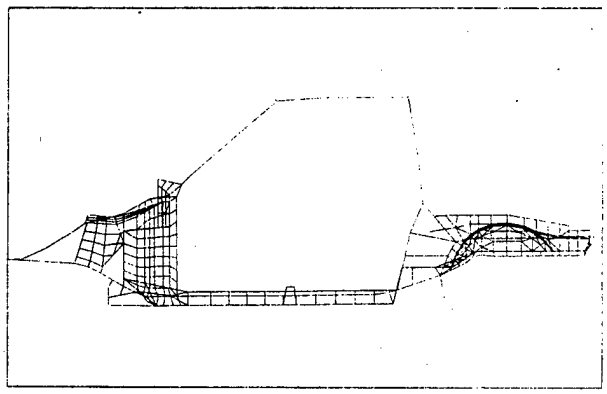

Figure 10. Structural Schematic

Figure 9 shows the concept adopted. The resistance function is assured by a structural nucleus in plate form, and the coating of the panels of structural type, fixed or movable, is accomplished through the use of a plastic composition.

The metallic structure shown in Figure 10 has a pickup-type configuration; this alternative was adopted to provide both front and rear-wheel spring suspension with drive connections located in the central part of the vehicle to assure:

--a drive assembly with a high degree of rigidity aimed principally at supporting any mechanical attachments through flexible fittings;

--front and rear shocks aimed principally at compensating for up and down jerks and jolts, to be outfitted in plastic material.

A "rear-section module" in polymer material is joined to the pickup structure. Figure 11 shows the two subassemblies joined together. Figure 12 shows the rear-section module as a separate item.

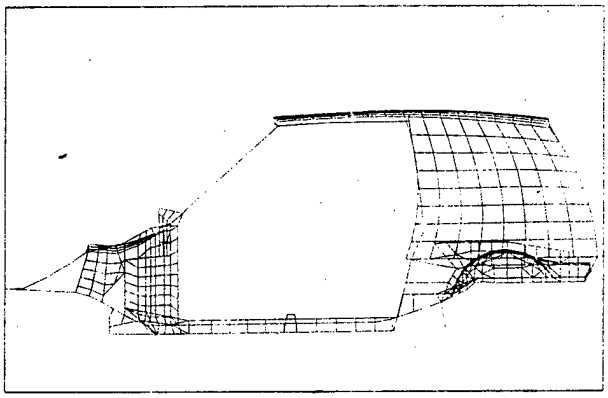

Figure 11. Structural Schematic and Rear-section Module

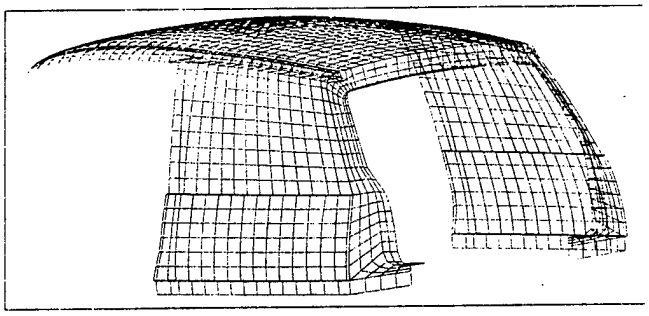

Figure 12. Schematic of Rear-section Module

When joined together, the two parts work in harmony to assure adequate rigidity with regard to the body, important for purposes of comfort; but, at the same time, they serve to limit reciprocal forces of a thermal origin resulting from the different coefficients of expansion. Figure 13 shows the contribution of the rear-section module to the rigidity of the whole and shows the weights anticipated for both the metal and polymer parts.

Figure 13. Table of Weights and Structural Rigidity

Weights	
--Framework	80 kg
--Rear-section module	16 kg
Torsional rigidity	
--Framework	382 kN/rad
--Framework-rear-section module	470 kN/rad

The door arrangement was developed by Alfa Romeo; among various alternatives a hybrid solution was chosen with framework in aluminum and external panel in composite material. The breakdown of the various elements is shown in Figure 14.

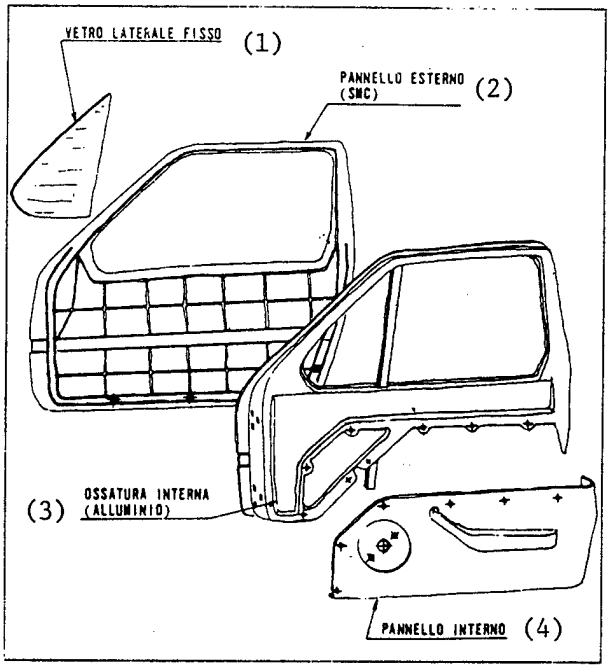

Figure 14. Door Plan

Key:
(1) Side window--fixed
(2) Outside panel--composition
(3) Interior framework--aluminum
(4) Inside panel

7. Chassis

The need to guarantee high levels of comfort and good steerability in a light car with a considerable variation in load on the axle led the researchers in tackling the problem of the rear-wheel suspension to adopt the solution of a

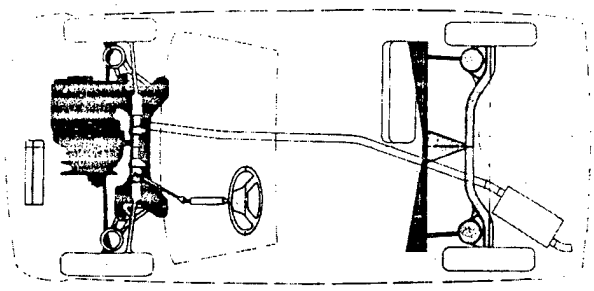

Figure 15. Chassis Diagram

rigid axle with balance control through pneumatic springs (Figure 15). The balance control makes it possible to maintain a high degree of flexibility in the suspension on limited runs, whereas in the case of the rigid axle, which offers inherent advantages in geometric precision, a particular solution is foreseen which will make it possible to achieve uniform directional performance of the car under empty or full-load conditions.

The rear suspension was researched through the construction of a mock-up as shown in Figure 16 [omitted] (in which we note pneumatic spring elements co-axial with the shock absorbers). Trials carried out on the mock-up showed appreciable improvement in the automobile's comfort; for example, the spectrums of vertical acceleration on a smooth road proved to be decidedly better than those of a present-day automobile, as shown in Figures 17 and 18 [omitted]. That improvement also holds true in the case of other road conditions (paved, dirt, etc.) and with the car loaded.

8. Motor

The development of the twin-cylinder direct-injected diesel motor is being carried out in close interaction with simultaneous research on a gasoline motor (Tema IV-11) with regard to the configuration, particularly in connection with the system designed to equalize the alternate forces of the first order.

Figure 19 [omitted] shows the longitudinal cross-section of the motor.

We retained the 75 mm bore which had served with excellent results for the development of the direct-injection motor with double intake valve used in the Finalized Energy Plan I; however, in this case, we plan to adopt a single intake valve per cylinder, and feasibility research is underway in that connection (partly also in the Tema IV-12). In conditions of normal intake, the motor will have an 18 kW capacity; in conditions of supercharging, this will increase to 22 kW, necessary to obtain the car's desired performance.

9. Gear Train

Figure 20 [omitted] shows the study of the continuous gear train in the solution using a belt which is elastomeric in air, centrifugal driving friction, hydraulic activating system and electronic control.

The total aperture is five, a value which guarantees the best compromise among obstruction, weight, yield and optimization of the motor coupling.

Also with regard to the gear train, the experience and results obtained in previous research in connection with the Finalized Energy Plan I provide a valuable reference point; theoretical and experimental research is presently underway at Pirelli to come up with a belt with reduced transmission losses in keeping with the project's fuel-consumption objectives.

8568
CSO: 3698/473

BRIEFS

PEUGEOT EXPERIMENTAL ELECTRIC CAR--Paris--The Peugeot SA group plans to introduce, around 27 June, an experimental all-electric and clean-running car, the "205," with a range of 100 km between charges and a maximum speed of 100 km/hr. According to the company, this experimental vehicle will be unveiled to the press on 20 June, then exhibited, and test-driven during VER [Experimental Electric Vehicle] Week, from 26 to 29 June at Versailles. The electric "Peugeot 205" was developed under a research program that resulted also in the building of a co-powered (electric batteries and gasoil) urban minibus with trailer. This new "205," whose outward appearance is identical to that of its predecessors, is the result of the joint research effort between Peugeot SA, the engine manufacturer Leroy-Sommer, specializing in electric motors, and SAFT [Stationary Accumulators and Traction Company], a manufacturer of dry cells and storage batteries. Its innovative aspect, according to Peugeot, lies in having succeeded in incorporating the batteries under the hood in the forward compartment of the vehicle without at the same time reducing the passenger comfort and ease of recharging it offers the user. The batteries developed by SAFT are an iron-nickel combination, resulting in a sharp reduction in volume and weight as compared with the traditional lead storage battery. This model of vehicle, to be introduced shortly, is in line with the policy being pressed by the French Agency for the Harnessing of Energy, namely, the development of new forms of powering at a lower energy cost. One of the goals of this policy is to reduce France's lack of energy self-sufficiency in petroleum products, through an incentive to create fuel-efficient vehicles and to make the best possible use of the surplus electricity produced at night by the network's nuclear power plants, by promoting the use of electric motors. [Text] [Paris AFP SCIENCES in French 30 May 84 p 68] 9399

CSO: 3698/476

BIOTECHNOLOGY

FRENCH AGREEMENTS WITH TAIWAN, PRC

Frankfurt/Main EUROPA CHEMIE in German 16 Apr 84 p 186

/Article: "PRC and Taiwan Conclude Biotechnology Agreement with France"/

/Text/ Shortly before the visit of Chinese Foreign Minister Wu Xuequian to Paris, France concluded a research agreement with the PRC in the field of biotechnology. It was also made known that the Institut Pasteur Production (Pasteur Institute) would supply the Taiwanese Ministry of Health with serum against the heptatitis B virus (Hevac B Pasteur). The serum is produced by this company with the aid of genetic engineering.

This agreement is of enormous importance to Taiwan where approximately 90 percent of the 18 million Taiwanese are afflicted with hepatitis. A plant which has yet to be built is supposed to begin producing the serum in Taiwan in 1986. In addition, both countries had agreed on close cooperation in the field of genetic engineering. A delegation from the Chinese national Committee for Science and Technology also recently visited the Pasteur Institute. A spokesman for the institute thought an agreement with the PRC similar to the one with Taiwan unlikely, since an agreement with Taiwan had already been reached.

The Pasteur Institute belongs to Sanofi-Holding which comprises the pharmaceutical and cosmetics interests of the state-owned Elf-Aquitaine group.

12552
CSO: 3698/453

BRIEFS

DANISH BIOTECH RESEARCH APPROPRIATIONS--As part of the government's goal to strengthen research and development in new and expanding areas, Education Minister Bertel Haarder (Liberal Party) on Monday presented to the Finance Committee of Parliament a proposal to spend 33 million kroner over the next 6 years in order to promote research in biomolecular technology. This area of natural sciences includes a number of disciplines, of which gene splicing is the most well known. In the Education Minister's appropriations request to the Finance Committee, it was stated that the research in question would deal with investigating the inner life and functions of biological cells in relation to commercial application. The results are expected to be able to be utilized in animal husbandry, improvement of agricultural crops, industrial fermentation processes and the prevention, diagnosing and treating of genetic and contagious diseases. (RITZAUS BUREAU) [Text] [Copenhapen INFORMATION in Danish 29 May 84 p 4]

CSO: 3698/482

CIVIL AVIATION

FRG FINANCING OF DEVELOPMENT, INSURANCE FOR AIRBUS

Duesseldorf VDI NACHRICHTEN in German 11 May 84 p 4

[Article by E. Heckmann: "Tax Billions Are Also Aloft: The FRG Supports Financing of the Airbus Program--Every Airplane Sale Supported With 6 Million DM"]

[Excerpts] The government of the FRG is putting up a 4.5-billion-mark guaranty for the airbus. It is supporting development with 2.3 billion marks and financing sales with 2 billion marks. Today no company in the world can finance big plane production all by itself. And for Europe's airplane there is no alternative. Prospects appear to be good for economic success assuming that at least 600 of the airbus A 320 under construction can be sold for 37.5 billion marks by the beginning of the 21st century. Lufthansa, too, is going to have to renew its fleet at a cost of 5 billion marks and will have a choice now that as a result of the airbus the Boeing Company no longer has a monopoly. In the case of the airbus it must be noted that the funds supplied are not coming only from the FRG. The governments of the partner countries, France, Great Britain and Spain, are also financing it similarly.

According to current guidelines of the FRG Government up to 60 percent of the costs of development work up to the point of mass production can be guaranteed in the form of "conditionally repayable funding." In the airbus program (because of developments in the international community it is possible to exceed the 60-percent figure) 90 percent of the basic development and 85 percent of costs of modernizing developments are being underwritten. Previous development funding has added up to 2.3 billion marks of which in the past 130 million marks were repaid by the industry. Because of the continuing high demand for capital further obligatory refunding has been conditionally dropped until 1994. For the A 320 program, the smallest member of the airbus family, the government of the FRG is supplying up to 1.5 billion marks (90 percent of the German developmental quota). That makes a total of 3.7 billion marks for the development of the three airbus basic models.

Already a number of years ago the companies obtained a production assistance subsidy of 600 million marks for the procurement of production facilities since aircraft of this size had never before been built in Germany. This subsidy is somewhat comparable to the idea of special operating funding in military procurement.

In this industry production must be financed almost entirely by foreign capital. The obligations of the industry to the banks are covered by a guaranty on the part of the FRG. The industry has taken over a countersecurity for one part of the obligations. This countersecurity amounts initially to 10 percent of 2.85 billion marks and as of 1982 amounts to 25 percent of 1.65 billion marks. According to plans in the industry these serial credits are to be repaid around the middle of the nineties after the sale of 860 aircraft.

The limits of the guaranty run to 4.5 billion marks of which thus far 4.1 billion marks have been exhausted. For the A 320 the additional financing requirement is estimated to be 1.2 billion marks. According to information supplied by the German Federal Ministry of Economics the current German federal budget will not be burdened with these amounts, except in the event that the FRG must meet its obligation as guarantor.

Sales financing is a word that immediately provokes associations with agriculture. Must one first initially finance a development program, then fund production and after that still have to subsidize sales? Is the aircraft construction taking place in Brussels? What is involved here is the fact that the sellers of the airbus are able to offer conditions similar to those offered by the American Exim Bank. Through sales financing the risk of interest changes at the banks is covered. The Hermes guarantor-indemnifications amount in Germany on the average to about 1 percent per year while the credit insurance costs in the United States are about 0.5 percent per year. Up until the end of 1983 of the sales financing funds about 320 million marks have been paid for interest funding and indemnifications for credit, insurance and exchange rate insurance. So far a total of 2,044 billion marks have been approved for 334 aircraft. This is an average of 6 million marks per airplane. After 1986 a limitation to 4 million marks per airplane is provided.

In December 1969 the airbus received the "green light" with the conclusion of the German-French agreement with regard to construction of the airbus A 300B. In these years airbus industry has established itself as one of the Western world's manufacturers of big airplanes and has shown that once again in Europe, too, it is possible to build qualitatively outstanding aircraft at marketable prices.

The figure of 12,000 persons employed directly and an additional 8,000 employed indirectly in Germany is only one side of the coin. The funds required for the construction of large aircraft are dizzying. But those are the completed transactions. In other words, one must relativize. According to industry plans up to the beginning of the 21st century 600 A 320's are to be sold at $24 million each. That amounts to 37.5 billion marks!

Lufthansa's fleet modernization program alone is costing Luftahansa 5 billion marks and the other airline companies are dealing with figures of the same order of magnitude even though their profit margin at the present time still does not permit any large-scale procurements. But there is no question that one of these days there will definitely be a procurement bottleneck.

American car drivers are beginning to find out what happens when the Americans are allowed to have a monopoly: subsequent to limitations (voluntary) on the import of Japanese automobiles prices and profits soared to staggering heights.

8008
CSO: 3698/463

ROBOTS, AUTOMATIC DEVICES INSIDE VW'S WOLFSBURG PLANT

Landsberg ROBOTER in German Mar 84 pp 14-16

> [Text] Hall 54 at VW in Wolfsburg is not the "hall of robots." Robots work intensively on the body shell. In the assembly hall for the new Golf, 4,300 people and only 42 home-built robots work "hand in hand." In the truest sense of the word, everything is turned upside-down, in the conveyor systems. While engines and components are being automatically assembled into subassemblies on the ground floor, automated body assembly, a reality for the first time, is taking place on the upper floor. VW's objective was: work with your head and not an excess of brain power. About 380 bolted and fitted joints are made with special machines. However, and this is new, tested robot elements are used for these pieces of equipment, from disc drive to control. Robots carry out heavy and sometimes complicated work without expensive sensors.

VW engineers approached the problem of controlling costs by means of automating the assembly area quite differently from the Japanese and others. In 1978 they had specific ideas for "mechanizing" the Golf. But it was not possible to automate the then current series, because several important basic prerequisites did not exist. So the knowledge about and the possibilities for automation were combined. In completely logical fashion they even became involved in the design, and the new Golf was born--designed to be assembled by automation. But not only was the Golf to be assembled by automation, the requirements for the jobs that were to be retained also carried a high standard. Without overreaching themselves, the engineers had to clear several barriers at the same time, to achieve a humane design for the workplace and for automation.

Everything that can be done today to humanize work and to automate is concentrated in Hall 54. Bright, cheerful and "quiet" workplaces on the one hand, to be able to provide good quality for automation, and on the other hand an image of a factory almost devoid of human beings.

One of the principal concerns was to divide final assembly into component assembly and engine assembly. Controlled by computers, the completed subassemblies reach the final assembly with something approaching absolute perfection. In the case of the subassemblies which were produced on the ground

floor, special machines, robots and humans are involved. The actual powertrain is constructed from the basic engine block as delivered. It consists of several subassemblies: engine mounts, subframe, engine and transmission, steering and suspension struts. Toe and camber are already adjusted on the powertrain.

In precise steps, with great expenditure for technology, the transmission is assembled on two round tables. To be more accurated, one round table is for the transmission for the 1.3-liter engine, and the second one is for the transmissions for the 1.6- and 1.8-liter engines. Special versions, including the automatic, are assembled here as a subgroup. Attached to subframes, the completed units are transferred to the upper floor for final assembly.. Here automated bolt tightening is the key concern. Complete control of all bolt parameters results in a definite increase in quality. Totally new paths had to be cleared here, right down to the design of the bolt. Just feeding the bolts to the loading plate and the actual checking of the bolts cost a great deal of money and nerves. Before a bolt is dispatched through a plastic hose to the bolt tightener, the length, bolt head height and diameter are checked in the sorting tray of the rotating dispatcher.

But more is required for automated assembly. It does not matter whether single-function automatic machines or robots perform the assembly or joining operations, nothing will work if the parts are not manufactured to very fine tolerances. Without incurring additional costs, premanufacture was trimmed exactly one-tenth, by more precise specifications and more intensive quality control. In order to keep the laboriously acquired knowhow about automated assembly equipment in house, only a small portion of the DM 220 million spent on automation went to outside sources. This allowed VW to realize its concept of identity in all installations more easily. In order to have flexibility, even in specialized machines, many units are built from stock robot parts. Not only mechanical components, robot controls as well have been "misappropriated." As a result, the programmability of special machines and peripherals does not present a problem, with simultaneous standardization of component groups.

Automatic checks are constantly performed before final assembly can actually begin. This applies particularly to the attachment of the fuel lines. It is not simply a matter of installing this flexible assembly from underneath. The line must also be inserted into a tunnel in the body and clipped into position. This is done automatically.

At another station the powertrain, complete with radiator, is assembled to the body. Before it is installed from below, locating arms swing into position in the side rails of the open body at the front. This open construction style was one of the basic prerequisites for automated assembly. To avoid having to reset toe and camber, the suspension strut mount is spot welded to the strut tower at the very end.

Another example: installation of the complete brake system. Where previously occasional problems were caused by dirt and such like, possible sources of mistakes are eliminated by automated assembly. The complete fuel tank, fully preassembled, also comes directly to the line ready for installation, where it is mounted to the body equipped with its retaining straps. It is the same with the exhaust system. Before it is installed, heat shields have to be fitted between the sheet metal of the tunnel as insulation for the passenger compartment. Only then is installation of the fully preassembled exhaust system possible from below. This is a particularly complicated step in assembly: the exhaust system has to be fed into the bodywork and they both have to be bolted together automatically at both ends. While the machine is feeding the exhaust system in, it is simultaneously bringing both ends together automatically, it slips a clamp over them and bolts everything to the engine. The rubber hangers are also automatically hooked over the body mounts. The rear axle is bolted to the body automatically, the bumpers are attached, and a robot attaches and fastens the closeout.

The new car is now almost complete. On the rest of the line the fully assembled front end is installed. To the second exactly it automatically meets the preplanned vehicle and is bolted on. Delivery and mounting of the wheels is also controlled in accordance with the customer's preprogrammed request.

In spite of the perfection of automation, in fact precisely because of it, human beings are in constant demand. At the moment when a red light goes on instead of the signal to continue. Then the equipment operator has to jump into the breach. Now he--as a trained electrician who has been involved since the planning stage--has the opportunity to demonstrate his capabilities. He has to identify and correct mistakes and shortcomings, otherwise the entire line is stopped. This is an advantage, because mistakes are not dragged along but are corrected where they happen.

German engineers have established a landmark in automated assembly in the manufacture of the new Golf A II. It is said there is nothing to compare with it worldwide. Design changes in the vehicle were necessary to accomplish this. The one that immediately catches the eye is the totally open bodywork at the front. This is not a "playground" or a "ghost factory." One hundred and twenty minutes of manufacturing time are saved per vehicle.

An articulated arm machine picks up the finished steering assemblies with a complicated gripping device and attaches them to the crossmember.

An R 30 carefully positions the battery on the side rail and tightens the clamps.

Manual labor according to instructions. Following the list drawn up by the station printer, belt pulleys are put on the conveyor in sequence.

The robot for V-belt installation is several sizes too large. Nevertheless, it installs the belts quickly and carefully.

The robot which puts either an emergency or a normal spare wheel into the spare tire well has seven axes of movement.

Assembly bolts that have been checked are fed through plastic hoses to the bolt-tightening machines.

The robot takes the color-keyed front airdam out of the piggyback receptacle and mounts it to the front end.

Programmable overhead conveyors. Robot components were "misappropriated" for the first time here.

9581
CSO: 3698/474

FUTURE DIRECTIONS OF ROBOTICS, AUTOMATION IN ITALY

Turin ATA INGEGNERIA AUTOMOTORISTICA in Italian Feb 84 pp 123-126

[Article by Antonio Strumia]

[Excerpts] Summary*

The fundamental characteristic of automation in the 1980's is flexibility: that is, the capability of producing or inspecting various pieces without appreciably changing the production line.

Robotics, flexible specialized machines, intelligent work centers are being combined with the final objective of the "no-man factory" (completed automated factory).

This paper gives both the present status of ever-changing automation and its future trends and stresses the changes in work organization induced by automation.

It also briefly examines the emergence of new professional figures within the framework of the companies which produce elements of automation.

2. Prospects of Robotics and Automation in Italy

The 1982 estimates place the worldwide population of robots at about 25,000 installed units, 50 percent of which are in Japan and the remaining 50 percent divided in equal parts between Japan and Western Europe [sic].

All of the forecasts of the market development show a growth rate of about 30 percent per year (for example, $840 million for assembly operations and $700 million for machine-tool operations, according to the Battelle projections 1992).

In recent years the international scene has witnessed a proliferation of license agreements and intercontinental cooperation and the entrance onto this scene of major industrial groups, particularly in electronics (GE, Westinghouse, IBM, NEC, Hitachi, Mitsubishi, Matsushita, etc.).

*Paper presented at the International Congress "New Technology--Work Organization and Professional Training," held in Turin from 1-3 November 1983.

The other side of the coin shows a market development which, in 1983, was considerably less than expected but an exorbitant increase in the number of manufacturers (more than 200 competing for a 1983 world market of ≅ 1 trillion).

Resistance of the user firm to the introduction of robotics is certainly greater than anticipated.

For the moment, the small- and medium-sized company is almost totally excluded. About 10 manufacturers have now invested in productive plants, each having a capacity of about 1,000 robots per year.

Thus, the supply now far exceeds the demand.

Paradoxically, this situation caused one observer to assert that, if a robot were sold for every operation suitable for robotics, the present trend would be quite different.

The total number of robots installed in Italy at the end of 1982 was about 1,500 units. The present market calls for about 500 to 600 robots per year at an estimated value of 80 to 100 billion lire.

The industrial potential includes both the large company and, even more, the small to medium company, for a total of about 25 manufacturers.

The industry clientele continues to be made up principally of companies connected with the automobile sector, including its parts suppliers.

The robotics culture is almost nonexistent.

Except for declarations of good will, the general impression is that of an industry which is having difficulty developing, which is having a hard time financing the investments needed for the product in question and whose presence on the international level is now extremely limited.

The industrial robot is certainly one of the most interesting tools for automating the factory of the future.

The present situation recalls that which prevailed at the end of the 1960's when, at the beginning of the minicomputer era and that of data processing for the industrial sector, the national situation, on the technical level, saw the appearance of certain products in tune with the technological developments of the moment.

Upon the growth of the market, the Italian firm gradually abandoned that sector and ended up being almost totally excluded.

In the case of robotics, the problem lies within an industrial substratum which is not only electronic but also mechanical, one in which tradition and the national presence are undoubtedly prominent.

Beyond the sectorial crisis now being experienced by the machine-tool industry, that fact could facilitate a different final result.

We need to define, within the scope of factory automation--a vast subject and certainly one of national significance--the roles of each one, maximizing the advantages and minimizing the disadvantages. The risk of failure lies in a feeling of exasperation on the part of the large company, in the concept of the domestic market, and, therefore, in an activity which tends to become introspective and is unable to direct its sights on the international market.

Whereas spot-welding robots and those used in painting operations and the loading and unloading of machine tools can consider themselves mature (in the sense that technological and practical problems have been largely resolved after a decade of operational activity and in the sense that the pertinent market is stabilized), the robotics sector now being rapidly developed is that of continuous welding and assembly. For these emerging sectors the technical problems of adaptability in many cases require the use of sensing elements (visual, tactile, force, etc.) and the solution of problems (sensory mechanisms, automatic vision, artificial intelligence) which imply great effort in research and development.

Therefore, the system should be willing to invest heavily in this direction, with percentages of investment in relation to billings, and these should be extremely high, at least during these years.

The national sectorial plans which call for a Finalized Technological Project in the production area and a Finalized Robotics Project for a combined appropriation of 100 billion lire in 5 to 6 years appear insufficient for this purpose.

Moreover, the 40 billion provided by IMI [Italian Credit Institute] financing in accordance with Law 46 for the robotics sector is unfortunately very little when compared, for example, with the 500 billion pledged by the French Government for the 3-year period 1983-1985 or the 1 trillion of investment planned by General Electric in the area of factory automation.

Even the university's role is presently marginal compared with the importance of the problem, despite the presence of small research groups with a high degree of capability and inspired with the greatest enthusiasm.

In any case, we must not forget that robots are one of the components of the "no-man factory" (automatic factory).

I cite here only for completeness:

--work centers which achieve greater mechanical production with more machine tools using the same facilities;

--design drawing assisted by computer (CAD = Computer Aided Design) which makes it possible to automate the designing of components and systems. The example which is classically cited is that of widely-used electronic components which are designed, produced and tested almost without the use of personnel;

--automatic storage systems (raw materials, semifinished products, finished products);

--automatic material transportation systems (prominent among which are self-propelled trolleys guided magnetically or by radiowave);

--automatic testing and inspection systems (among these we may cite measuring robots which have brought the methodology of measuring machines into the shop environment);

--and, last but not least, the whole gamut of microcomputers, minicomputers and mainframes which are used in all applications. These are the connective fabric which links the new types of operative machines and robots together and makes the change in the work system more flexible.

However, it is certainly true that we are on the threshold of a new technological breakthrough which can be achieved only with the concurrence of a number of events among which are:

--a drastic reduction in the price of the robot and other elements of flexible automation accompanied by improved performance and less critical operability;

--a new method of designing the pieces and subsystems, taking into consideration the possibility of automatic assembly;

--a new method of designing the operative machines and the factory itself which will be converting those machines into a situation of complete automation.

Presently, it is the robot which must adapt itself to an environment designed substantially by man (layout, operative machines, etc.).

Certainly, by approaching the problem in a different way we could obtain simple robots. A few examples of this new method of operation are coming to us from Japan, with automatic factories for the textile industry deprived of illumination (henceforth, no longer necessary).

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SALES, SUBSIDIARIES OF MATRA AUTOMATION BRANCH

Paris ELECTRONIQUE ACTUALITES in French 1 Jun 84 p 6

[Article by H. Pradenc: "MATRA-Automation Looking Forward to 1984 Sales of FF 900 Million"]

[Text] The computer-integrated manufacturing and machine-tool show gave Mr Mas an opportunity to introduce to the press the Automation branch of the MATRA [Mechanics, Aviation and Traction Company] group, one of the three major French companies involved in computer-integrated manufacturing, of which he is general manager. MATRA-Automation is expected to achieve sales of FF 900 million in 1984, over half of which should result from specific industrial operations issued from MATRA and Manurhin. And the new "intelligent" products such as Visiomat and Syscomat are carrying the hopes of the branch management on markets which they believe are expanding: flexible automation and visual control.

As is known, the strategy of MATRA-Automation consists in taking up positions in sectors that cannot be bypassed by firms wishing to automate, i.e. control equipment and software and certain mechanical components of machine-tools. As for the equipment that MATRA-Automation cannot offer to its customers and that would require too much time and money to develop, OEM [original-equipment manufacturer]-type agreements could be used. This is already the case for the MATRA-Manurhin numerical controls that could be used on Olivetti machines under such an agreement.

As far as technology is concerned, MATRA-Automation would also rather sign cooperation agreements than invest heavily in research and development. We should mention the computer-aided design agreement recently signed by MATRA-Datavision and Renault, which will add mechanical application software to the MATRA Euclid system. Mr Mas indicated that this policy would be continued by the two partners in other specific cases.

10 Specialized Subsidiaries

The potential available to MATRA-Automation is held by the 10 subsidiaries that form the branch and employ 1,000 people. According to Mr Mas, this distribution of expertise among small and medium-size units gives some flexibility to MATRA-Automation. MATRA-Datavision (projected 1984 sales: FF 130 million, including 75 percent of export sales) possesses the Euclid

computer-aided design system which is selling well abroad but is facing some reluctance on the French market. Robotronics, now being created, is introducing the Visiomat form-recognition system which is about to be industrialized, and the Syscomat robot and flexible-cell control, three units of which have already been ordered. As far as assembly is concerned, Sormel is offering the Cadratic and Shiva robots. ADL [expansion unknown] is manufacturing medium-size assembly cells. Jazz-Industrie is acting as a systems house and can take charge of a whole project. Assembly activities account for FF 60 million in the 1984 budget.

MATRA-Manurhin (projected 1984 sales: FF 200 million) is manufacturing machine-tools as well as numerical controls. Two novelties: a graphic interactive programmer, the PIG 1000, designed to upgrade a CNC [computerized numerical control] machine a few years' old, and a production controller, the CP 1600, which allows for a progressive approach to production automation.

As far as specific applications are concerned, MATRA-Automation has subsidiaries such as MATRA-GCA [expansion unknown] which manufactures production equipment for electronic components (projected sales: FF 200 million, including 75 percent of export sales). Note that with subsidiaries such as Plastrex and Micon, MATRA-Process Control is taking up positions respectively in the composite materials and continuous process control sectors.

9294
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THOMSON OF FRANCE TO SAMPLE PLASTIC EPROMS

Paris ELECTRONIQUE ACTUALITES in French 15 May 84 p 20

[Article by JPDM]

[Text] Thomson SC [Thomson Semiconductors] should be in a position by this June to sample its programmable 2716 N EPROM [erasable programmable read-only memory] which, once sealed in its plastic package, hence windowless [as published]. (This is a different product from Oki's plastic EPROMs, which do have a window).

This sampling will be part of a major OTP [One-Time Programmable] (as it is called) EPROM program which is targeting the start of industrial-scale production of 16-Kbit NMOS [n-type metal oxide semiconductor] and CMOS [complementary metal oxide semiconductor] devices (2716 N) by year-end 1984, 64-Kbit NMOS devices (2764 N) around the beginning of 1985, and 128-Kbit NMOS devices (27128 N) by mid-1985. This program responds to the needs of users who, in 70 percent of the cases, program their EPROMs only once but who nevertheless want to be able to modify the content of the memorized program themselves, which ROMs do not permit.

Towards Plastic Altogether

Compared with a normal EPROM, the OTP EPROM will be around 15 percent cheaper. This represents very little when compared instead with the price of an ROM [read-only memory], which costs 25 times less, for example, than an EPROM for a 32-Kbit application (13 francs versus 30 francs) [as published], but the indirect advantages of the EPROM are significant: Only one circuit to stock for several different programs; very rapid modification of a program; flow-soldering capability in the case of windowless plastic versions; no ROM mask developmental cost.

OTP EPROMs demand, on the part of semiconductor manufacturers, an improved passivation of chips, and quite complex testing at the wafer level (if determination must be made that all the bits are programmable before their definitive programming). On the other hand, the tests are simpler once the devices have been packaged. The OTP EPROM market took off in 1982, and represented 3 percent of EPROM sales in 1983 and 13 percent this year.

According to Thomson SC, OTPs will represent more than 30 percent of total ceramic and plastic EPROM sales in 1985, attaining a level of 50 percent by the end of 1985. In 1987, OTP's will cover 70 percent of the market. Of this market, 32-Kbit NMOS's and CMOS's will represent barely $20 million in 1985, the year in which sales of these devices will reach their maximum. According to Thomson, 64-Kbit and 128-Kbit OTP sales will also reach their maximum in 1985, with volumes of $180 million and $215 million respectively. The market for 256-Kbit OTPs (NMOS's and CMOS's) will start to boom in 1985 to the detriment of all the other types; it will peak in 1988 with a world-wide sales volume of $900 million.

A 256 K EPROM by Early 1985

Conventional ceramic EPROMs will continue to represent a major program at Eurotechnique and, under this program, the 256-Kbit EPROM occupies a particularly important place, since it is expected to account for a $140-million market in 1985 (aside from the OTP market). Tentatively, samples should be available by the beginning of 1985, with production planned for the second half of that year. This memory will involve a relatively simple 1.7-micron/2-polysilicon-level technology that will yield a 24-mm^2 chip area (The Intel chip covers an area of only 20 mm^2 but with a more complex technology). Thomson SC's 128-Kbit EPROM, presently undergoing limited sampling (production planned for year-end 1984) uses a 3-micron technology and a 24 mm^2 chip, similar in area, therefore, to the future 256-Kbit one. By comparison, the company's 16-Kbit and 32-Kbit CMOS EPROMs (which cover 70 percent of the world market) utilize a 5.5 micron technology!

This year, the major portion of the EPROM market is being covered by the 64-Kbit Model 2764 ($300 million) which Thomson has begun recently to produce in very large quantities. The EPROM CMOS market continues marginal to date ($30 million in 1985 for the 27C32, $70 million for the 27C64, and, in 1984, $36 million for the 27C128). In 1987, on the other hand, the market for the ceramic Type 27C256 (hence, exclusive of the OTP) should attain its maximum--$160 million--followed, in 1988, by the 1-Mbit type with a $213-million market. Eurotechnique is targeting the introduction of its 27C256 for the beginning of 1986 and of its 1-Mbit type for the end of 1986, with production of the 27C64 planned for the end of 1985.

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BRIEFS

VW RESEARCHES SEMICONDUCTOR MATERIAL--For extremely high speeds in electronic data processing conventional "chips" of silicon are no longer adequate. New compounds such as gallium arsenide and indium phosphide can, however, still not be produced in a form which is sufficiently pure to permit faultless operation. Investigations supported by the Volkswagen Foundation are now looking for a more exact characterization of the material and are trying in cooperation with manufacturers to eliminate the defect source. Microminiaturization and maximum integration are characteristic of the present trend in semiconductor technology toward fast electronic switching. In the present manufacturing technology the active portions of individual structural elements are only a few thousandths of a millimeter "big." In fact, throughout the world structures having still smaller dimensions are being tested. It is intended that they shall take over ever more complicated problems, solve them ever more rapidly and if possible also become at the same time even cheaper. This is what is expected of electronic data processing by all those who work with computers. The scientists are directing their attention toward the semiconductor materials. If the demands of the users are to be met the chips must become continually smaller and be continually more closely packed. In order to achieve this a search is being conducted for new materials. The Volkswagen Foundation has made 264,000 marks available for the corresponding research, which is being carried out by Professor W. Moench at the University of Duisburg. [Excerpt] [Duesseldorf VDI NACHRICHTEN in German 11 May 84 p 2] 8008

THOMSON SEMICONDUCTOR PRODUCTION PLANTS--Aix-Les-Bains--Most of the fabrication of "Thomson" semiconductors will henceforth be done in France, at two production and testing plants--one in Savoie at Gresy-sur-Aix, near Aix-les-Bains, the other in Lorraine, around Nancy. To date the production of Thomson semiconductors has been done in the Far East, particularly the Philippines. Several reasons--reliability, efficiency, complexity, transportation costs, a gain in time, and political instability--have led the Thomson management to repatriate these operations. The Gresy plant will be developed on the basis of the Alcatel Components Unit in Gresy (35 employees), which was taken over by Thomson around the end of 1983, under agreements signed with CGE [General Electric Company]. This unit, whose payroll will total 150 employees in 1984 and 300 in 1987, on the basis of a cumulative investment of 260 million francs [as published]. The Nancy plant, which is larger, will have 460 employees in 1986. Its investment will total several hundred million francs. [Text] [Paris AFP SCIENCES in French 30 May 84 p 38] 9399

OLIVETTI PRESIDENT OUTLINES STRATEGY TO 1990

Paris ELECTRONIQUE ACTUALITES in French 1 Jun 84 p 8

[Article by F. Berge: "Mr De Benedetti, Introducing Olivetti's Strategy: 'Alliance With AT&T Is the Only Alternative to European Stagnation'"]

> [Text] The Olivetti president just introduced his strategy to 1990, focussing on his ambition to see the Italian group become a "global contender" (in data processing, office automation, telecommunications) on the world market in the context of its agreement with AT&T. According to Olivetti, this attack is also a response to the lack of European prospects, and its president even mentioned the danger of seeing the old continent "colonized" by U.S. and Japanese firms.

At a recent international press conference that took place near Paris, the Olivetti top management outlined the global context of the firm's long-term strategy in the context of its recent agreement with AT&T (ELECTRONIQUE ACTUALITES dated 13 January 1984).

This alliance, which was necessary to ensure the long-term survival of the Italian group, actually forms the foundation of the "global competition" level, the objective to which Mr De Benedetti keeps harking back.

"The global competition which is about to start can be faced effectively only through the creation of functional coalitions of enterprises on a world-wide scale," he thus indicated. Indeed, the Italian firm is now obviously aiming at a single market: the world. As is known, its agreements with the U.S. telecommunications giant should enable Olivetti to increase its sales in the United States this year by close to $250 million, due to shipments of microcomputers adapted to the U.S. firm's requirements (ELECTRONIQUE ACTUALITES dated 13 April 1984).

In this context, the Italian's ambition is just to represent an alternative to the Japanese giant and IBM, no more, no less. To achieve this goal, Olivetti intends to develop the concept of "integrated environment" in its products, based on the "Line 1," which at present consists of a line of minicomputers (M30 and M40 plus the M60 that was just announced) to which

work stations are connected, actually microcomputers (M2L, M24, etc.) as well as word-processing stations (ETS 2000, etc.) and peripherals, all these being controlled by a series of software (using, among others, the Unix and MOS operating systems). However, the question remains as to whether this line as a whole actually represents an integrated global offer or whether, under present conditions, it is not in fact an "ideal" objective still to be reached.

Mr De Benedetti also indicated that the firm he manages will continue its investment policy in years to come, especially by investing venture capital in firms that may be less "strategic" than AT&T but that would, among other things, strengthen Olivetti's representation in certain specific subsectors.

It is clear that in this respect Europe is far from being a privileged field of operations for Olivetti, a company for which an industrial agreement represents primarily an exchange of markets and technologies, whereas, according to Mr De Benedetti, the European groups manufacturing data-processing and office-automation equipment are essentially competing on a single market while being eager to acquire new technologies.

In spite of all that, the Olivetti president mentioned his company's cooperation with CIT-Alcatel--which, as is known, should lead among other things to the creation of an electronic typewriter factory in France--as being one of the few positive and large-scale examples of European collaboration in the electronics sector, but he found it regrettable that Europe should, as he said, "demonstrate its unability to overcome national divisions and be insufficiently aware of the transformations now taking place."

Olivetti Tripled Its Profits in 1983

Olivetti's 1983 sales reached Lit 3,736 billion and its profits amounted to 8 percent of its sales, i.e. Lit 295 billion. In 1982, profits were Lit 102.8 billion for sales of Lit 3,341 billion.

This tripling of its profits enabled the parent company to distribute a divident of Lit 240 per ordinary share and Lit 260 per savings share. The evolution of the group enabled it to strengthen its financial structure in 1983 by increasing its capital from Lit 954 billion to Lit 1,202 billion, most of the additional capital being contributed by AT&T.

At the same time, its debts dropped by 15.9 percent, from Lit 862.9 billion to Lit 726 billion.

9294
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FRANCE TO FUND COMPUTER-INTEGRATED MANUFACTURING IN 1984

Paris ELECTRONIQUE ACTUALITES in French 1 Jun 84 p 4

[Article by H. Pradenc: "The State Will Spend FF 450 Million on Computer-Integrated Manufacturing in 1984"]

[Text] All those involved in the production apparatus may not yet agree on what the concept of "computer-integrated manufacturing" covers, but facts show that this is not an empty concept. This was shown at "Productique 84" [1984 Computer-Integrated Manufacturing Show], the first such event to be organized by the CCAP (Coordination Committee of Computer-Integrated Manufacturing Associations); in addition to the show, lectures were attended by an audience of 1,000. At the national level, the Computer-Integrated Manufacturing Plan will also allocate FF 450 million this year to develop equipment that will make the concept of automated manufacturing a part of everyday life.

The CCAP represents a meeting place for associations involved in computer-integrated manufacturing, such as AFCET [French Association for Economic and Technical Cybernetics], MICADO [French Association to Develop Computer-Aided Design and Drafting], AFRI [French Industrial Robotics Association], and ADETAA [Association for the Development of Automation Techniques in Aquitaine], which contributed to its creation. "Productique 84," the first such show organized by the CCAP, was designed to show robotics, computer-aided design and manufacturing, engineering, and included a series of lectures. Some 40 examples of automated production applications were described. This series of lectures showed that equipment which often had an investment return of 2-3 years could enable users to achieve the results expected, i.e.: marked reduction of in-process inventories, a 3-10 percent reduction in finished product rejects, and raw material savings, to name only a few. It was interesting to note that a certain material analogy existed between various applications, a similarity which is likely to lead to a standardization of automation components. The need for specialized consultants in certain sectors became apparent.

A press conference held at the close of the show provided an opportunity to review the French Computer-Integrated Manufacturing Plan, to which the IFM (Industrial Modernization Fund) is to devote 60 percent of its resources.

This year, the plan will allocate FF 450 million for production automation. Roughly, FF 100 million will go to the Meca procedure, FF 270 million to encourage production, pilot projects will receive FF 25 million, and aid to diagnostic FF 40 million from the State and as much from the regions; finally, FF 40-50 million will be allocated to research.

As is known, measures were taken by the government: solidarity contracts for computer-integrated manufacturing will promote a shorter work week as well as automation, and the Meca procedure will finance 5-20 percent of the investments made by small and medium-size firms. As far as production is concerned, development contracts are now being negotiated. Twenty-eight such contracts have already been promised aid, 20 of which involve foreign companies at the three poles represented by Renault, MATRA [Mechanics, Aviation and Traction Company] and CGE [General Electric Company], in particular for specialized developments in weaving, wood processing and plastics.

The contract defining the computer-integrated manufacturing activity of Renault-Automation and the associated public aid is about to be signed. The MATRA-Automation contract is being negotiated, especially with respect to computer-aided design (MATRA-Datavision) and the development of the Robotronics Visiomat and Syscomat systems. Contracts have also been signed with CGE concerning industrial process control and the development of robot motors. The dossier concerning the engineering pole is now being examined.

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BULL OF FRANCE PLANS INVESTMENT, PLANT EXPANSION

Investments in 1984

Paris L'USINE NOUVELLE in French 31 May 84 p 42

[Article by Eric Walther and Patrice Malina: "Bull Is Looking for Industrial 'Status'"]

> [Text] With six--and soon seven--industrial sites, Bull owns a large production apparatus. But it lacked the true "industrial spirit" that is a must in an exceedingly competitive sector. Therefore, it just undertook a regular offensive for quality, especially at its Angers factory. This offensive is starting to yield results.

Restructuring of the group, new strategic decisions, financial rigor, marketing reorganization. All right. But Bull's recovery also required a serious upgrading of its industrial plant, which had also been repeatedly upset by the many changes of orientation that took place in recent years.

Six industrial sites, three of which resulting from the acquisition of SEMS [European Minicomputers and Systems Company] and Transac, and soon a seventh at Marcq-en-Baroeul, in the North department: the French leader in data processing is now endowed with a large production apparatus and it is busy restoring it and making it uniform. An undertaking which is on the right track , according to Francis Lorentz, general manager of the group, who is confident that "industrial status will be achieved late in 1985."

The Angers plant, which employs over 3,300 people and produces medium and large-size computers, is now recovering. Problems in managing its rapidly increasing personnel, an integrated-circuit encapsulation technique that took a long time to implement although it had been developed by Bull itself, subassemblies inadequately tested prior to their introduction: all these problems did not fail to hinder and delay computer shipments, especially in the case of the DP7 system, a machine entirely designed in France.

Jean Antier, the new plant manager and former boss of the IBM-France Montpellier plant, who was called to help in Angers last year, does not conceal that the current situation is serious: "The first thing to do, then, was to

keep our head out of the water," he said. After reviewing all of the company's products, he hired a quality-control manager and prepared a reorganization of working schedules. In 1983, FF 127 million were invested, and close to FF 200 million will be invested this year. A regular offensive which appears to be already yielding results: "We are now operating on schedule and quality improved in the ratio of one to five," Jean Antier told us. "But, on the latter point," he added, "much remains to be done. We could still do two or even three times as well."

The productivity increase, one of the mainstays of the group's strategy, should be offset by the adoption of a system of rotating shifts. Negotiations are under way to arrange for some 300 employees to "rotate" in three 33-hour shifts.

Certainly, Angers is the largest Bull factory, and 45 percent of its production is exported. But if the company does not standardize its whole production plant, it cannot hope to remain competitive. Especially since the Angers factory includes the International Logistic Center, which manages all of the group's customer accounts and receives, processes and ships all the orders, and which could not operate if there was a production lag at other factories.

As a result, a global investment program of FF 900 million--compared with FF 650 million in 1983--has been provided for this year. The new managers of the former SEMS factories of Thomson have much to do to catch up with the group's other factories. From now on, there will be no room for error as the group is planning to balance its accounts by 1986..

A nationalized company, Bull cannot afford any faux pas with respect to employment. This will call for some tricky maneuvering. Indeed, in 1983 and 1984, production will have increased by 40 percent without any personnel increase. And this trend can only be confirmed in such an exceedingly competitive industry. Regradings, plant flexibility, capacity optimization: Bull will have to innovate and go against some of its traditions. Briefly, it must simply recover the "industrial spirit" that it was so cruelly lacking.

Belfort: Bull Is Exciting Envy

The Bull Peripherals Division is employing 2,500 people in Belfort and 320 in the Paris area. In addition to peripherals, it was also entrusted with manufacturing the Micral microcomputer and the 61 DPS systems, which were later on transferred to Angers. In 4 years, FF 231 million were invested. This effort will be stepped up in 1984: FF 110 million are to be invested. With sales that rose from FF 600 million in 1981 to FF 1.137 billion last year, the "peripherals" unit has reached profitability: it is no longer generating losses for the Bull group.

With a workload representing 2 years of work (including 20-25 percent for subcontracting) and assuming commercial results are confirmed, Bull Peripherals could hire 100-200 people this year.

In a local environment marked by lay-offs (Peugeot and Alsthom), Bull is arousing envy: last year, the factory received close to 7,000 job applications for 250 positions. Most applications came from unskilled workers.

On the other hand, Bull is having problems attracting to Belfort the engineers it needs.

Angers Plant Expansion

Paris ELECTRONIQUE ACTUALITES in French 25 May 84 pp 1, 7

[Article by Ph. Marel: "Improving Production: Bull's Vital Priority"]

[Text] Angers--To catch up with the other manufacturers of data-processing equipment, "we must urgently improve industrial production." This is how Mr Lorentz summarized one of the group's major imperatives on the occasion of the recent visit which the president of the Republic paid to the Bull factory in Angers. But although progress has been achieved, not all obstacles have been overcome yet.

In visiting the Bull Angers factory, Mr Mitterrand, president of the Republic, wanted to demonstrate his "special interest" in a company that has "rounded a dangerous cape" and is "assured of balancing its accounts." This dangerous cape, which was essentially a financial one, was actually rounded by Bull in recent years and, as far as production is concerned, the Angers factory which manufactures mainly the DPS-7 systems is exemplary, even though not all of its problems have been solved.

It took 2 years before the DPS-7 system, which represents over 20 percent of all of Bull's sales, could be produced under normal conditions. Production was insignificant in 1980 and reached 170 machines in 1981 and 348 in 1982, but the objectives were reached only in 1983 with 572 systems.

When Mr Antier (formerly of IBM) took over production management at the plant, his first observation was that "rampant demoralization" was prevailing within the company. Reorganization was therefore necessary and the investments made at the factory increased accordingly from FF 99 million in 1982 to FF 127 million in 1983. They should increase by another two thirds this year.

But all the efforts made until now are only a first step; the productivity ratio was improved by a factor of 1 to 5, but the goal is to reach a factor of 10 so that, as Mr Lorentz confided, the DPS-7 operation will become profitable by the end of 1985. This productivity effort included reorganizing work at the unloaded-circuit-board workshop (where 300 people out of 3,000 are employed).

However, some unions fear that the next stage in the group reorganization may involve the "resorption of excess personnel," an issue that all have been raising from the start and something which is out of the question according to the Bull management and some unions, although Workers Force announced a figure of 3,000 for the group as a whole.

Bull's challenge is also to prepare the future of the DPS-7 line.

Next year, the company will introduce a new line which, under an agreement recently signed with MATRA [Mechanics, Aviation and Traction Company]-Harris, will mark the transition from the CML [current-mode logic] technology to the CMOS [complementary metal-oxide semiconductor] technology and will result in systems far more powerful than the present ones.

To do this, the factory area will be increased by 110,000 m^2 (i.e. by 50 percent) and component insertion will be automated. This new and expanded line will thus act as a driving force in the group's overall range of products, both in France where these systems are at the heart of the company's office automation strategy, and abroad where two thirds of the systems produced are shipped.

The 1,000th DPS-7 system was also shown to the president of the Republic; it will be shipped to the FRG next month.

9294
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FRG EFFORTS TO GAIN EXPERIENCE IN, PROMOTE VENTURE CAPITAL

Support for Technology-Oriented Firms

Duesseldorf VDI NACHRICHTEN in German 11 May 84 p 13

[Article by Klaus P. Friebe: "Rejuvenating the Industrial Society: VDI Technology Center in Berlin Supports Microelectronics Projects"]

[Excerpts] Since the beginning of the seventies an industrial restructuring process has been discernible in the FRG which is a consequence both of saturated demand, increased competition in national and international markets and is essentially a consequence of a technologically oriented change. Many questions which are being hotly discussed today spring from this profound transformation.

However, besides the technological renovation of established enterprises the subsidizing of new technologically oriented enterprises merits increased attention. Data to be found in the special program entitled "Applications of Microelectronics" show that almost half of the subsidized firms were not founded until after 1970--so that thus there is distinctly an innovative potential here.

The absence hitherto of a functioning risk capital market in the FRG and the special difficulties which are encountered by the potential founders of enterprises whenever their future product or their service performance involves the latest technology have prompted the BMFT in 1983 to start a model experiment entitled "Founding Technologically Oriented Enterprises" (TOU).

Hitherto such initiations of new firms have come about (as shown, for example, by a VDI-TZ investigation of the 25 most successful new firms in the last 10 years) not through subsidizing activities on the part of the state but rather as a result of "conflict." That is, their proprietors had left their jobs in the course of a disagreement with their former employers and had set themselves up independently. And as shown by the data in the special program entitled "Applications of Microelectronics," of the approximately 2,000 subsidized firms 14 percent were in 1980 not yet in existence, or were in other words to be considered new companies.

The State Provides Stimulation

Thus it is only logical that the state should supply systematic stimuli here in order to moderate the special difficulties encountered in the new establishment of high technology firms and in order to rescue the planning of such firms from the realm of the haphazard and provide the founders of such firms with predictable prospects. The enterprises which we have in mind here are characterized by the following criteria:

i. younger than 3 years,

ii. fewer than 10 employees,

iii. with majority ownership in the hands of the founders,

iv. making a product which is innovative, risky but economically promising, and

v. involving expenses too high for the financial situation of the founders.

The TOU program is a model experiment on two levels. On the one hand it encompasses only specific regions of the FRG and on the other hand concentrates on specific technologies. The regions are Berlin, the Hamburg area, the Ruhr, the Saar, the Karlsruhe area, Pforzheim and East Bavaria. In these regions newly founded companies of all types are counseled by BMFT commissioned technology consultants and are financially subsidized by the BMFT. Throughout the FRG, but with a limitation to microelectronics applications, newly founded firms are subsidized by the VDI Technology Center. In addition, through so-called risk capital companies it is also possible to have access to the TOU program throughout the entire FRG.

The subsidizing spectrum of the program falls into three phases. Phase I may be described as the design phase: the proposed firm establishment is described, the technological, organizational, commercial and especially the sales plans are worked up. Here the state supplies up to 90 percent of the cost with a maximum of 54,000 marks. In Phase II 25 percent of the cost must be supplied by the new entrepreneur himself; a maximum of 900,000 marks can be subsidized in order to continue development in this phase up to the point of manufacturing. In addition, in cooperation with banking institutions further funds can be procured in order to reach the goal of Phase II, namely readiness for manufacturing. Phase III permits a guarantee against failure amounting to 80 percent or a maximum of 1.6 million marks, in order to start manufacturing and marketing.

This model experiment is scheduled to run up until 1986. That means that applications can be accepted for 4 years. The experience gathered in this way should serve either to initiate further measures of this sort or to make corresponding changes in the basic concept. At the present time there is universal agreement only on the fact that subsidizing of new enterprises in the FRG is absolutely necessary for such enterprises are the elixir of life and fountain of youth for our highly developed industrial society.

What can now be said after about 8 months of warmup time as to the results obtained thus far? Has the program been accepted, where do strengths and weaknesses seem to lie, what conjectures can one make regarding further development? The results must be measured against the goals of the program and these briefly are the following:

i. the establishment of more technologically oriented enterprises,

ii. more risk capital for such enterprises,

iii. more knowledge of the requisite legislative framework.

Since the start of the program in July 1983 280 applications have been submitted to the VDI Technology Center. About 40 projects are at the present time being subsidized in Phase I and Phase II. The average subsidy is now about 500,000 marks per project. In the financial accounting unexpected difficulties of corresponding magnitude have arisen. Since it has been impossible at the beginning of such a complex program to have available a proven decision technique the first examinations and especially the rejections required very expensive processing. A lack of the appropriate infrastructure in the FRG became evident since there were neither private industrial capacities or other external capacities which one could resort to in making such decisions.

Unpleasant as this situation--long processing times--may have been for the impatient applicants nevertheless it testifies to the sagacity of the initiators of the TOU program in recognizing seasonable industrial activities which meet an existing demand. Analysis of the new foundation phases which thus far have received positive decisions indicate a decidedly high technical level; the new products consistently aim at existing niches in the national market. From this one can then conclude that on the one hand there is no lack of recognition of existing technological niches in the market while on the other hand there does seem to be a lack of attention to the other side of the fence, that is, to the situation beyond our national borders.

Review of 1983 Projects

Duesseldorf VDI NACHRICHTEN in German 11 May 84 p 14

[Article by Reinhard Baumgarten: "Speeding Up Innovation With Venture Capital: Increasing Activity in the FRG for the Past Year"]

> [Text] The fact that in the United States innovations reach the market promptly is attributed, inter alia, to the massive application of private "venture capital." Entire branches of industry have become great thanks to this "chance capital," such as, for example, the semiconductor and microprocessor industry, with other new ones arising such as the biotechnology industry. The growth opportunities are all the greater the sooner it is possible to carry out the financing of industrial innovation projects with

the help of suitable venture capital markets. For about 1 year there has been evidence in the FRG of increasing activities directed toward strengthening venture capital.

Because of worldwide competition there has been a steady sharpening for German entrepreneurs of the need for especially intensive activity in technological innovation. The innovation gaps are becoming steadily shorter and consumption of capital progressively greater. Whereas in earlier times technologies and products could be stationary in the marketplace for over a generation today many of them are already outdated after 2 to 3 years. The big enterprises have in part recognized this development while growth enterprises discern in this fact their basic philosophy. For example, at Siemens the sales fraction of products newly developed in the last 5 years amounts to 50 percent. Nixdorf invests annually about 10 percent of its turnover in research and development.

For the long term it is only rapid innovation, that is to say the fast transfer of basic research into the marketplace, which protects one's share of the market. In this respect German enterprises differ substantially from American and Japanese.

In the FRG--as in the United States--basic research occupies a position at the start of an innovation process. However, frequently the industrial conversion of this research into new products and processes takes place too slowly so that the enterprises are unable to profitably exploit the market's growth phase. Often there is adherence to one's own developments although the competition may be already ahead and threatening a takeover with the help of foreign licenses employed with the aim of adapting immediately to the market. But besides the "not-invented-here syndrome" there is also a widespread inclination to adapt foreign licenses to German standards instead of to market requirements. All this results in the end in innovative backwardness. Enterprise growth in the processing industry is, however, possible only through an effective rapid exploitation of technology. Such use of technology requires partially changed value attitudes and managerial instruments in addition to new forms of organization, cooperation and financing. Up to now there has still been largely absent in the FRG experience with the instrument of venture capital financing with the object of more rapid utilization of technology.

By the term venture capital (VC), which is most readily translated as "chance capital," we mean a participatory or quasi-participatory capital which so-called VC companies make available to technology-oriented founders of enterprises or to young technology enterprises having potentially an above-average capacity for growth.

Besides supplying participatory capital the venture capital company from the outset takes over decisive management functions in the technology enterprise. Managerial employees of the VC company specializing in particular industrial branches furnish "management assistance" in the founding and growth phase. Usually also the venture capitalist has the right, in critical phases, to change the staffing of managerial levels in the young enterprise. VC is thus both capitalization and innovation management at one and the same time.

On the European plane the Commission of European Communities--in addition to the general initiatives in the domain of innovation financing--is increasingly also espousing the theme "Development of VC Markets for the Regeneration of Industry." In November 1983 for the fourth time a symposium was held along these lines at which corresponding recommendations to the commission were worked up.

In individual countries of the European Economic Community the national governments have already made efforts to stimulate the development of risk capital markets. However, there are important features of the American experience which in part are not being given attention such as, for example, the principle of using venture management to secure the success of young growth enterprises.

Against the background of developments in other countries there has also been in recent days some stirring on the scene in the FRG. Thus within the last half year banks and insurance companies in particular have made increasing efforts toward founding their own risk capital companies. These activities would probably leap ahead if there were a positive decision to set up a so-called "second market" through which young technology enterprises could be put on the stock exchange.

Pacemakers in these activities are primarily the publicly subsidized initiatives; these include at the present time the German Risk Financing Company (WFG) founded and organized under civil law in 1975, its losses from business participations being covered up to 75 percent by the German Government. Since around 1981 the WSG by changing its business policy in the sense of increasing flexibility and invididually tailored real capital methods has been involved in activities analogous to VC commitments. A further development of the WSG, in which 29 credit institutions hold shares in the company, as a purely private VC company without the support of a government guaranty, is over the long term an entirely possible development.

And then there is the program sponsored by the German Federal Ministry of Research and Technology to sponsor "the founding of technology-oriented enterprises (TOU)." The TOU is intended to improve the launching opportunities for firms in areas of technology slanted toward the future while simultaneously stimulating the risk capital market for such new firms. The program got under way in June 1983 and has triggered an active response.

It was set up in 1982/1983 by the senator for industry and transport with the goal of putting emphasis on future-slanted innovation projects and provides for the promotion in Berlin of established companies, newly founded companies and company branches in the field of new technology.

Experience up to now proves that it is an extremely flexible financing instrument and can rightly be called the "link with venture capital." By April 1984, using money from the innovation fund, 21 projects were subsidized with about 10 million marks. These included 13 foundings of technology-oriented enterprises. In most cases commercial banks were ready in conjunction with the innovation fund to participate in these technology enterprises. In this process on the average the ratio 1:3 which is usual in the United States

among SBIC's (small business investment companies) turned out to be the best proportion. For every mark of private participatory capital invested about 3 marks of public innovation capital are supplied. The goal is to secure that this ratio shall change in the direction of progressively more and more private venture capital so that finally state innovation financing shall be superfluous.

One may clearly discern steps in this direction: the initial function of the state instrumentarium in Berlin has up to now led to the founding of three private risk capital companies:

i. the VC Company for Innovations, Ltd, of which members are the Deutsche Bank AG, the Berliner Industriebank AG and the Industriekreditbank AG (September 1983),

ii. the Stock Company of the Berlin (West) Municipal Savings Bank (November 1983),

iii. the Industrial Partnership Holding Company, Ltd, Berlin (WBB), in which stockholders are the Bank of Berlin AG, the Nixdorf Computer Company, Standort Elektrik Lorenz Company, Hanover Finance, Inc, and the Commerzbank AG (April 1984).

The "Second Market" Is Urgently Needed

In the following paragraphs we summarize a number of suggestions which--individually or in combination--can over the long term favor the creation of private risk capital funds. In analogy to the American OTC, the London USM or the Paris "Second Marche" the introduction of a so-called second market as a component of the official stock exchange is inescapably necessary even if only to avoid our falling further in arrears relative to the other European countries. This second market must be clearly distinguishable from the official trade market and the open market. The chances that then a greater number of enterprises can be brought into the stock exchange are substantial, not least of all because positive instances of this already exist.

For example, at the end of June and the beginning of July 1983 the SM Software Company, in which risk capital has been invested for the first time, was introduced into the stock exchanges when it was only 3 years old; the issue volume was oversubscribed 29-fold. One of the most successful entries onto the exchange in recent years has been that of the Berlin firm GFC Stock Company for Computer Systems in Medicine for which the quotation has considerably risen since its appearance on the exchange at the end of 1983.

The stock exchange expert commission has submitted a concrete proposal for reform of the stock exchange admission process to the German Federal Ministry of Finance. Among its provisions are:

i. a substantially simplified admission process for newcomers to be exchanged (a prospectus text which is only two to four pages long; submission of the last two annual account closings to be sufficient);

ii. no maximum or minimum limits on the company but a minimum capital of 1 million marks to guarantee a controlled price setting;

iii. stock market quotations depending on market circumstances, for example, only on settling days or for special transactions;

iv. in contrast to the sharpening EC guidelines with regard to increasing emphasis upon investor protection: no obligation to list the entire capital (in analogy to the London USM);

v. applications for admission to be via listed credit institutions at every stock exchange.

The long-demanded tax deductibility of stock-issuing costs was approved by the German Government at the end of June. In addition, consideration should be given to the idea of permitting the enterprise itself to submit application for admission to the exchange; the corporation tax should be done away with.

More important now than a long discussion of the structure of individual conditions is the need for rapid introduction of the second market. It has already taken 15 years for concrete proposals having some prospect of success to be presented. In the meantime--it is claimed--the boundary conditions, especially for the investment of risk capital, are in Germany incomparably worse than those in other countries.

The proposal that a central location should be set up for the second market seems worthy of consideration. Among other possibilities, Berlin, which is a very active scientific and technological sector, would be a good location for a central "innovation" stock exchange.

Banks' Dealings With Venture Capital

Duesseldorf VDI NACHRICHTEN in German 11 May 84 p 15

[Article by Peter Martin: "The Banks Do Some Rethinking: A Number of Funds Have Been Established in the Last Year"]

> [Text] While in the FRG there exist about two dozen bank-supported holding companies they primarily finance established small business enterprises. Genuine venture capital for young technology enterprises has only recently been made available by the credit institutions. Thus it is apparent that up to now the banks have been lacking in the right know-how. But this is what the American competition has to offer which is now vigorously moving into the German market.

"Inflexible and too bureaucratic." This is the way critics judge an institution which for a decade has participated in growth-oriented German enterprises and which has at least made some little attempt to close the so widely

deplored risk capital gap. The institution is the German Risk Financing Company, Ltd, in Frankfurt, a joint organization of 29 banks capitalized at 50 million marks and which dispensed venture capital long before the idea had even been discussed in the FRG.

The chairman of the board of the Commerzbank, Dr Walter Seipp, was especially critical in his remarks when speaking to journalists at the Business Publicity Association in Duesseldorf in replying to a question: "Before a project gets financed by the WFG I'm afraid the wind would have gone out of the inventor." And one cannot deny that he probably knows whereof he speaks for Seipp's Commerzbank has a 10-percent share in the WFG.

Also the holding companies of other credit institutions (by now there are about two dozen which have invested a total of 800 million marks in over 1,000 participating enterprises) were and are known to only a few initiates. And up to now they have not exactly overindulged in dazzling success. Also they are certainly not venture capital companies in the classical sense but participate more commonly in established small business enterprises rather than in new firms.

But it is here in the German banks that the few specialists may be found who possess the know-how for dealing with genuine venture capital. Thus, for example, the WestKB, the corresponding subsidiary of the West German State Bank (WestLB) has up to now invested over 55 million marks in such participation. It is true that it is not in this respect any giant in American terms but it has been making investments for almost 15 years and in addition the two business managers Peter Koehler and Horst von Lengerke have an abundance of concrete experience which is something that cannot be said of many very audible promoters of the venture capital business.

For example, the WestKB participated with 1 million marks in BCT Computer whose shares appeared on the market awhile back. Since evaluations of this enterprise among those on the floor of the exchange and business insiders with respect to its solid financing, products and management have been widely divergent one cannot say that the WestKB is investing only in respected and established small businesses. Rather it appears that they are quite prepared to undertake considerable risk. Thus the banking subsidiary was recently confronted with the fact that it is not only died-in-the-wool venture capital which involves risk but that there is risk in today's conventional investments. A 3-million-mark investment, Hesse Automobile Tires, must be written off.

For years the extending of risk capital on the part of the banks--for example, through holding companies--took place quietly and all in all never achieved more than relatively slight significance. However, with the revived discussion of venture capital ever more credit institutions feel compelled to give thought to new activities in this area.

"Every venture capital hit brings in more profit than billions of dollars in credit," is the enthusiastic statement of John L. Hines, president of the venture capital subsidiary of the American big bank, Continental Illinois.

What such a "hit" can look like was demonstrated by the institute in the computer Highflier Apple, where what was in banking terms a rather modest investment of $500,000 had multiplied by a factor of 80 within 5 years. In the meantime on the other side of the Atlantic in the lucrative venture business already over 70 banks have joined the party. Altogether in the United States there are over 600 venture capital enterprises.

What wonder then that here, too, at home bankers started to listen when the idea of venture capital began to be eagerly discussed well over a year ago between Flensburg and Bodensee. It is true that 29 of them since the middle of the seventies have already had access in the above-mentioned WFG to a field of experimentation with investments of risk capital; nevertheless, some of them freely admit that this WFG is still not "turning base metals into gold."

Rolf Brunswig, chief of the Siegen Savings Bank approaches venture capital with great enthusiasm but--in the opinion of some critics--without sufficient know-how. Last year his institution founded the "Siegerland Fund 1" which is to invest 5 million marks of risk capital in that region--which is not precisely overflowing with future-oriented businesses. Brunswig demonstrated to his colleagues how quickly such a foundation process can go. From the original idea to final presentation of the completed fund only about 6 months went by--including the necessary special approval by the responsible supervisory officials--an approval which had been a stumbling block for other savings banks.

The North Rhine-Westphalian Minister of Economics Reimut Jochimsen has been so taken with the venture capital idea that now the West German State Bank (WestLB) is now under pressure to do something new in the way of risk capital. There is talk that the WestLB will be active jointly with the state of North Rhine-Westphalia. In any case here they have experience to fall back upon. Officially the directors of the State Bank certainly keep themselves still fully covered and chairman Friedel Neuber confirmed in a newspaper article once again that: "Venture capital is nothing new in the banking business."

But let us return to Brunswig's Siegerland Fund to which specialists have been attributing a diversity of chances. But there is much more unanimity in the admiration for his shrewd tactics and the sovereign manner in which he punched the project through. Besides he supplied, in his fund, a model deserving discussion, namely what might be called the regional solution which is oriented entirely to "local" needs and in so doing accepts in the bargain the fact that here on the spot one does not necessarily have the best possible expert but perhaps only retired entrepreneurs, bank employees, perhaps also local politicians all working in the fund administration. In such a situation the advantages of a good knowledge of the given circumstances are opposed by the dangers in conflicts of interests. Also the Goeppingen District Savings Bank is considering a similar concept. Above and beyond this there are a number of savings banks (for example, Aachen) which have become active with programs for risk-carrying foreign capital and participation capital.

Money From the Investors

In this venture capital involvement on the part of the savings banks--or rather more exactly thus far, on the part of a savings bank, since there has meanwhile prevailed for the most part radio silence in the corresponding combines and senior institutions--the colleagues in the cooperative credit institutions also do not want to lag behind. Awhile ago Hans-Wilhelm Bartmann, director of the Mortgage Bank in Berlin, revealed in an interview that his institution is also pottering about in a venture fund. At the present time according to the cooperative banker they are still playing around with various business law and tax possibilities in order to make the structure of the fund interesting for investors.

The Mortgage Bank would be the first bank which collects its money from the investors. Its colleagues consider this, because of the high risks involved, as too dangerous for their business reputation. Also in the DG Bank, the senior institution of the cooperative banks, views favoring venture capital are being repeated.

These plans are substantially more concrete at the German Bank where also there had already been the first flow of money. After having already several months previously declared its readiness to establish a venture capital fund of 10 million marks in Berlin together with the Berlin Industrial Bank and the Industrial Mortgage Bank, F. Wilhelm Christians, spokesman for the directors of the German Bank, announced at the traditional "Nikolaus Press Conference" in December 1983 that his institution was also climbing aboard Techno-Venture in Munich with 20 million marks.

This fund which is expected to be outfitted with a total of 130 million marks is at the present time the most professional foundation among our domestic venture firms. In addition to the bankers this management society also includes the electronics firm of Siemens together with what is probably the largest German administrator of assets, TRV in Munich, as well as the famous American venture group TA Associates. As suppliers of money, in addition to Siemens and the German Bank still more first-class addresses may be expected to become members of the club--considering the illustrious names already represented the acquisition of new members is probably no great problem. Techno-Venture business manager Rolf C. Dienst confirms this: "We wouldn't have had any trouble getting twice as much money."

What he doesn't say: According to report the Commerzbank made efforts to become a participant but in contrast to the German Bank never did get under way. On the other hand Allianz, the insurance giant, refused to come along, for fundamental reasons presumably since up to now in the insurance business it has been the rule that insurance policies involve enough risk and hence these companies invest their capital with extreme caution. It is only recently that a rethinking has been apparent. At least one insurer has already invested in the United States in venture capital.

While up to now most banks have been rather inclined to hold back the foreign competition is already starting to put the market in its sights. A precursor

here is the City Bank which since the first of April has also been active with a venture capital fund in Frankfurt. In this matter the Americans want to get in "with real gobs of money and not just with dribbles." As necessary they are prepared to make up to 140 million marks available for German venture capital in the coming years.

In this they can lean on long years of experience in the United States and Great Britain. Dr Wolfgang Schaaff, head of Citicorp Venture Capital, Inc, declares himself to be optimistic. In presenting his plan he declared in Frankfurt: "It is our task together with competitors--such as Techno-Venture in Munich and the WFG--to open up the market."

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UNIVERSITY, INDUSTRY TECHNOLOGY TRANSFER INCREASING IN FRG

Munich SUEDDEUTSCHE ZEITUNG in German 2 May 84 p 47

/Article: "Progress in Technology Transfer: Science and Business Have Common Goal"/

/Text/ Bochum (DPA)--Within 8 years a nearly comprehensive system of information transfer between colleges and other scientific facilities and businesses has been established in the FRG, said Dr Wolfgang Budach of the university/business liaison office of the University of Bochum in the Ruhr. In a study Budach included all liaison and counseling offices of universities and technical colleges, nationwide technology transfer facilities, large-scale research institutes, Max Planck Societies, Fraunhofer Societies, as well as those of industry, commerce and the trades.

In the course of the establishment of this technology transfer, the network connecting the various neighboring universities and technical colleges is becoming more clearly defined. This also includes closer cooperation with the Chambers of Industry and the Trades. In addition to the general transfer of technology from the universities and technical colleges which makes the results of scientific research available to business, there are already numerous special facilities such as the Plastics Processing Institute at the Technical College of Aachen which acts as a special trade advisor. The Technical Academy of Esslingen with 600 advanced training courses each year is a significant educational center for Baden-Wuerttemberg. And at the University of Hanover a central agency works to promote development within the trades.

Areas of Special Emphasis

According to this study, Schleswig-Holstein, North Rhein-Westphalia, Bavaria and Baden-Wuerttemberg in particular have statewide facilities which are promoted by their respective ministers. Located in Stuttgart, the Steinbeis Foundation for Economic Advancement works in conjunction with 17 technical colleges and technology transfer centers. The activities of 15 large-scale research institutes at the federal and state level are determined by these areas of special emphasis. Such activities continue to indicate that new knowledge gained above all in nuclear and fusion research can be made available for completely unrelated areas of labor and production.

Spectacular Successes

The 57 technical Max Planck Institutes and research centers and the 30 institutes of the Fraunhofer Society are the source of a special kind of technology transfer. They have been "in the business" for decades. Their spectacular successes include the work in the field of plastics by Karl Ziegler, in the 1930's and 1940's head of the Max Planck Institute for Coal Research (at that time the Kaiser Wilhelm Institute for Coal Research), which led to the establishment of a new branch of industry in Germany and in the rest of the world. Such breakthroughs do not occur every day. But science and business still quietly hope for them in the future as a result of their increasingly close cooperation. However it is the tedious work which still predominates.

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FRG EQUIPMENT TO USSR

Landsberg PRODUKTION in German 5 Apr 84 p 41

[Article: "Bosch Delivers Equipment for Russian Machine Tools"]

[Text] Stuttgart (p)---The Erbach/Odenwald industrial equipment section of the Robert Bosch Company, Stuttgart, has received from the Soviet foreign trade organization Stankoimport/Stankodetal a contract for the delivery of electrical and electronic equipment for machine tools. According to the most recent issue of the BOSCH ZUENDER [BOSCH SPARK PLUG], a workers' newspaper, the contract has a total value of 24 million marks. In detail it involves CNC controls, programmable controls and electrical servodrives. Delivery is to be before the end of this year. Commercial ties have been in existence between the industrial equipment section of the Bosch Company and Stankoimport for the last 10 years. There has been a steady increase in the number of contracts given out by the Soviet foreign trade organization. According to earlier Bosch reports, development capacity and manufacturing and sales activities in this domain are being substantially expanded.

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